

**EPA Superfund  
Record of Decision:**

**ABERDEEN PESTICIDE DUMPS  
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ABERDEEN, NC  
09/30/1991**

**#SNLD**

**1.0 SITE NAME, LOCATION AND DESCRIPTION**

THE ABERDEEN PESTICIDE DUMPS SITE (THE "SITE"), CONSISTING OF FIVE DISTINCT AREAS, IS LOCATED NEAR THE TOWN OF ABERDEEN, MOORE COUNTY, NORTH CAROLINA (FIGURE 1). THE FIVE AREAS ARE FARM CHEMICALS, TWIN SITES, FAIRWAY SIX, MCIVER AND ROUTE 211.

ALL OF THE AREAS ARE LOCATED IN THE "SANDHILLS REGION" OF THE ATLANTIC COASTAL PLAIN PROVINCE. THE REGION IS CHARACTERIZED BY ROLLING HILLS WITH 200-300 FEET OF TOPOGRAPHIC RELIEF. THE PRIMARY AQUIFER IN THE ABERDEEN AREA, THE SANDHILLS AQUIFER, IS COMPRISED OF BOTH THE MIDDENDORF FORMATION AND, WHERE PRESENT, THE OVERLYING PINEHURST FORMATION. THE THICKNESS OF THE AQUIFER VARIES WITH TOPOGRAPHIC RELIEF, AND RANGES FROM A FEW FEET IN THE STREAM VALLEYS TO 300 FEET AT THE CREST OF THE HIGHER RIDGES. SOILS IN THE VICINITY OF THE FIVE AREAS BELONG TO THE CANDOR SERIES. CHARACTERISTICS OF THIS SERIES ARE WELL TO VERY WELL DRAINED SANDY SURFACE SOILS, AND SANDY TO SANDY CLAY LOAM SOILS OF THE COASTAL PLAIN UPLANDS. THESE SANDY SOILS HAVE EXCELLENT PERMEABILITY AND ARE INEFFECTIVE AS FILTERS WHEN USED FOR WASTE DISPOSAL.

ACCORDING TO THE 1990 CENSUS, THE POPULATION WITHIN THE ABERDEEN CITY LIMITS IS ABOUT 2,780. GROUNDWATER IS THE MAIN WATER SUPPLY WITHIN A THREE MILE RADIUS OF ABERDEEN. TWELVE MUNICIPAL WATER WELLS OPERATED BY THE TOWN OF ABERDEEN DRAW WATER FROM THE SANDHILLS AQUIFER. THE SYSTEM CURRENTLY HAS 1,640 HOOKUPS, BUT THE EXACT NUMBER OF PEOPLE SERVED IS UNKNOWN. HOWEVER, THE TOWN MANAGER ESTIMATES THAT 3,500 PEOPLE ARE SERVED BY THE TOWN SUPPLY. THE 3,500 PEOPLE ARE LOCATED WITHIN THE SERVICE AREA WHICH INCLUDES A 1 - 2 MILE RADIUS OUTSIDE THE ABERDEEN CITY LIMITS. APPROXIMATELY 1,500 - 2,000 PEOPLE ARE SERVED BY PRIVATE WELLS.

THE ABERDEEN AREA IS PRIMARILY RESIDENTIAL WITH SOME LIGHT INDUSTRY. THE TWIN, FAIRWAY SIX, AND MCIVER DUMP AREAS ARE ALL ZONED RESIDENTIAL, WHILE THE FARM CHEMICALS AREA IS ZONED COMMERCIAL/RESIDENTIAL. THE ROUTE 211 AREA IS ZONED INDUSTRIAL, BEING INCLUDED IN A SMALL STRIP OF LAND WHICH OFFSETS THE RAILROAD TRACKS WITH AN INDUSTRIAL ZONING. THE AREA OUTSIDE THIS INDUSTRIAL ZONING IS ZONED RESIDENTIAL.

THE PRIMARY RECREATION IN THE ABERDEEN AREA IS GOLF WITH 36 CHAMPIONSHIP GOLF COURSES WITHIN A 10-MILE RADIUS OF ABERDEEN. THERE ARE NO ENDANGERED SPECIES OR CRITICAL HABITATS, NATIONAL PARKS, NATIONAL WILDLIFE REFUGES OR INDIAN RESERVATIONS IN THE VICINITY OF ABERDEEN.

FOUR OF THE FIVE AREAS ARE IN THE ABERDEEN CREEK DRAINAGE BASIN. THE ROUTE 211 AREA IS OUTSIDE THE DRAINAGE BASIN. ABERDEEN CREEK IS A NORTH-SOUTH FLOWING TRIBUTARY TO DROWNING CREEK WITH A DRAINAGE AREA OF APPROXIMATELY 38 SQUARE MILES.

FIGURE 1 SHOWS THE LOCATION OF EACH AREA AND THE TOWN OF ABERDEEN. THE LOCATION AND DESCRIPTION OF EACH AREA ARE SUMMARIZED BELOW.

**1.1 FARM CHEMICALS AREA**

THE FARM CHEMICALS AREA IS LOCATED IMMEDIATELY SOUTH OF NORTH CAROLINA HIGHWAY 5 (PINEHURST ROAD), ON THE WESTERN CORPORATE LIMIT OF THE TOWN OF ABERDEEN, AND WEST OF PAGES LAKE (FIGURE 2). COORDINATES ARE: LATITUDE 35 DEGREE 08'24"N; LONGITUDE 79 DEGREE 25'58". ACCORDING TO THE 1980 CENSUS, THE ESTIMATED POPULATION WITHIN A 1-MILE DISTANCE OF THIS AREA IS GREATER THAN 1,000.

THE FARM CHEMICALS AREA IS SITUATED ON FLAT TERRAIN. HOWEVER, DOWNGRAIENT (NORTH) OF THE AREA AND AT A DISTANCE OF APPROXIMATELY 500-700 FEET IS PAGES LAKE, WHICH IS USED FOR SWIMMING, FISHING, AND GENERAL RECREATION USE. IT IS A MAN-MADE BODY THAT IS FED BY ABERDEEN CREEK, WHICH FLOWS TO THE SOUTH.

THE LAND TO THE SOUTH AND WEST OF THE FARM CHEMICALS AREA IS OCCUPIED BY COMMERCIAL OR LIGHT INDUSTRIAL PROPERTIES. RESIDENTIAL PROPERTY BOUNDS THE AREA TO THE EAST. THE NEAREST RESIDENTS

LIVE APPROXIMATELY 250 FEET FROM THE AREA. NORTH OF THE AREA IS HIGHWAY 5 AND DIRECTLY ACROSS HIGHWAY 5 IS THE TWIN SITE AREA. THE FARM CHEMICALS AREA ACCOMMODATES AN ABANDONED CHEMICAL BLENDING FACILITY WHICH CONSISTED OF APPROXIMATELY 19 STRUCTURES. FIGURE 2 SHOWS THAT THE SITE LAYOUT AND FIGURE 2A IS A KEY IDENTIFYING THE STRUCTURES. AS NOTED ON THE LEGEND, SOME OF THE BUILDINGS HAVE BEEN REMOVED.

## 1.2 TWIN SITES AREA

THE TWIN SITE AREA LIES IMMEDIATELY NORTH OF HIGHWAY 5, AT THE WESTERN CORPORATE LIMIT OF THE TOWN OF ABERDEEN, AND WEST OF PAGES LAKE. COORDINATES OF THE AREA ARE: LATITUDE (35 DEGREE 08'24"N; LONGITUDE 79 DEGREE 25'58"W.) THE ESTIMATED POPULATION WITHIN A 1-MILE DISTANCE OF THE SITE IS GREATER THAN 1,000.

THE TWIN SITES AREA CONSIST OF THREE DISPOSAL AREAS (FIGURE 3). AREA A AND B ARE BOTH OPEN DUMPS WITHIN WOODED AREAS. AREA A IS APPROXIMATELY 400' X 250'; AREA B IS APPROXIMATELY 235' X 120'; AND THE TWO AREAS LIE APPROXIMATELY 350' FROM ONE ANOTHER. PESTICIDE-LIKE MATERIALS ARE BURIED AND PARTIALLY VISIBLE IN A SMALL PATCH OF WOODS IN AREA C BETWEEN AREAS A AND B. SINCE MOST OF THE PESTICIDE-LIKE MATERIALS ARE BURIED, THE DIMENSIONS OF AREA C ARE UNKNOWN.

THE TWIN SITES AREA IS SITUATED ON MODERATELY SLOPING TERRAIN (5 PERCENT) WHICH SLOPES IN A N-NE DIRECTION TOWARDS PAGES LAKE. PAGES LAKE IS ABOUT 350 FEET DOWNGRAIENT FROM THE DISPOSAL AREAS. GROUNDWATER SEEPS AND STANDING WATER POOLS ARE FORMED BETWEEN THE DISPOSAL AREAS AND PAGES LAKE.

SOUTH OF THE TWIN SITES AREA IS HIGHWAY 5. EAST OF THE AREA IS WOODED PROPERTY. A ROAD BOUNDS THE WESTERN EDGE OF THE AREA. NORTH OF THE AREA IS PAGES LAKE. THE NEAREST RESIDENTS LIVE ABOUT 350' UPGRADIENT FROM DISPOSAL AREA B. A JAYCEES HUT AND BOY SCOUT CAMP ARE LOCATED 350' DOWNGRAIENT OF THE TWIN SITES AREA. ALTHOUGH THE JAYCEES HUT HAD NOT BEEN USED SINCE 1985, THE FACILITY HAS BEEN USED AS A DAY CENTER BY A DRUG REHABILITATION GROUP SINCE AUGUST 1990. THE BOY SCOUT CAMP IS USED 2-3 TIMES PER WEEK FOR SCOUT MEETINGS AND ACTIVITIES, BUT IS NOT USED AS A CAMPING AREA. HOWEVER, DURING A RECENT EPA SITE VISIT A NEWLY CONSTRUCTED BEACH AREA WAS OBSERVED DIRECTLY DOWNGRAIENT OF THE BOY SCOUT CAMP ALONG THE WESTERN SHORE OF PAGES LAKE.

## 1.3 FAIRWAY SIX AREA

THE FAIRWAY SIX AREA IS SITUATED OFF NC HIGHWAY 5 WEST AT "THE PIT" GOLF LINKS. COORDINATES OF THE AREA ARE LATITUDE 35 DEGREE 08'50"N; LONGITUDE 79 DEGREE 27'27"W. LOCATED ABOUT 1.6 MILES WEST-NORTHWEST OF THE ABERDEEN CORPORATE LIMITS, THE AREA IS RURAL AND SPARSELY POPULATED. THE ESTIMATED POPULATION WITHIN A 1-MILE DISTANCE OF THIS AREA IS LESS THAN 1,000.

THE FAIRWAY SIX AREA CONSISTS OF A CLEARED AREA UTILIZED DURING A TEST BURN CONDUCTED IN DECEMBER 1986, AN AREA OF SURFACE CONTAMINATION (APPROXIMATELY 345' X 225') ON THE SOUTH AND NORTH SIDES OF FAIRWAY NO. 6 IMMEDIATELY ADJACENT TO THE TEE AREA, AND SIX EXCAVATED TRENCHES (FIGURE 4).

THIS AREA IS BOUND TO THE NORTH BY THE PITS GOLF LINKS GOLF COURSE. SOUTH, EAST AND WEST OF THIS AREA IS WOODED PROPERTY WHICH IS PRIVATELY OWNED AND WAS ONCE PLANNED FOR RESIDENTIAL DEVELOPMENT.

AT THE FAIRWAY SIX AREA, THE GENERAL TOPOGRAPHY DIPS GENTLY TO THE NORTHEAST (1.5 PERCENT GRADE) TOWARDS THE GOLF COURSE LAKE. TWO SWALES DRAIN SURFACE WATER FROM THE AREA OF KNOWN CONTAMINATION. DUE TO PRIOR REMOVAL ACTIONS AT THIS AREA, SURFACE RUNOFF FROM THE IMMEDIATE AREA DRAINS INTO THE EXISTING TRENCHES.

## 1.4 MCIVER DUMP AREA

THE MCIVER DUMP AREA IS LOCATED APPROXIMATELY 0.5 MILE NORTH OF THE JUNCTION OF SR 1112 AND SR 1106, WEST OF ABERDEEN (FIGURE 5). THE COORDINATES ARE APPROXIMATELY LATITUDE 35 DEGREE 07'40"N; LONGITUDE 79 DEGREE 27'40"W. THE ESTIMATED POPULATION WITHIN A 1-MILE DISTANCE OF THIS AREA IS APPROXIMATELY 300.

SITUATED IN A SPARSELY POPULATED RURAL AREA, THE MCIVER DUMP AREA CONSISTS OF THREE DISPOSAL AREAS:

AREA A - PRIMARILY A RUBBLE DUMP KNOWN AS "LUCK'S LANDFILL".

AREA B - ALSO KNOWN AS THE "BAG SITE" CONSISTS OF A NATURAL DEPRESSION APPROXIMATELY ONE ACRE IN SIZE AND 15 FEET DEEP.

AREA C - LOCATED BETWEEN AREAS A AND B COVERS APPROXIMATELY 22,000 SQUARE FEET.

LAND USE IN THE VICINITY OF THIS AREA IS PRIMARILY AGRICULTURAL. OTHER LAND USE IN THE AREA IS THE LANDFILL ITSELF (AREA A) AND A BORROW PIT NEARBY THAT WAS USED BY BILL LUCK. THIS AREA IS BOUNDED TO THE NORTH BY AN UNNAMED TRIBUTARY OF ABERDEEN CREEK. THIS TRIBUTARY LIES APPROXIMATELY 100 FEET NORTH OF AREA B AND FLOWS EAST-SOUTHEAST INTO ABERDEEN CREEK.

#### 1.5 ROUTE 211 AREA

THE ROUTE 211 AREA IS LOCATED IN MOORE COUNTY APPROXIMATELY 1 MILE EAST OF THE TOWN OF ABERDEEN (FIGURE 6). IT IS IN A WOODED AREA ROUGHLY 1,000 FEET SOUTHWEST OF ROUTE 211 EAST AND IS ACCESSIBLE BY AN UNPAVED ROAD. THE COORDINATES OF THIS AREA ARE LATITUDE 35 DEGREE 07'02"N; LONGITUDE 79 DEGREE 23'41"W.

THIS AREA IS AN OLD SAND MINING PIT OR BASIN, THE BOTTOM OF WHICH APPROXIMATES A CIRCLE 78 FEET IN DIAMETER AND 8-20 FEET DEEP. THE AREA OF CONTAMINATION IS ESTIMATED TO BE APPROXIMATELY 0.11 ACRES.

THE ROUTE 211 AREA IS LOCATED IN A SPARSELY POPULATED AREA. THE LAND SURROUNDING THE AREA IS GENERALLY PINE WOODS WITH SCATTERED ABANDONED SAND-MINING PITS. THIS AREA IS APPROXIMATELY 1,000 FEET SOUTHWEST OF ROUTE 211 EAST AND 100 FEET NORTHEAST OF THE MAIN TRACK OF THE ABERDEEN AND ROCKFISH RAILROAD. TWO ACTIVE COMMERCIAL/INDUSTRIAL FACILITIES ARE KNOWN TO BE LOCATED WITHIN 1,000-2,000 FEET OF THE AREA. THE NEAREST HOMES ARE LOCATED 0.25 TO 1 MILE FROM THE AREA. THE POPULATION WITHIN 1 MILE OF THE AREA WAS ESTIMATED AT 543 RESIDENTS.

THE ROUTE 211 AREA IS BASICALLY A BASIN, SEPARATED FROM SURFACE WATER BY AREAS OF HIGHER ELEVATION. HOWEVER, GROUNDWATER IN THE AREA MAY BE THREATENED BY THE SITE CONTAMINANTS. TWO COMMUNITY WATER SUPPLY SYSTEMS USE GROUNDWATER WITHIN 3 MILES OF THE AREA. HOMES AND BUSINESSES NOT SERVED BY COMMUNITY SYSTEMS ARE BELIEVED TO BE ON PRIVATE WELLS. LOCAL WELL LOGS SHOW THE UPPER PORTION OF THE AQUIFER TO BE THE SOURCE OF DRINKING WATER. THE WATER TABLE IS AS HIGH AS 15 FEET BELOW THE LAND SURFACE.

#### **#SHEA**

### **2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES**

#### 2.1 SITE HISTORY

##### 2.1.1 FARM CHEMICALS AREA

FROM AT LEAST THE MID-1930'S THROUGH 1987, THREE SUCCESSIVE COMPANIES, BLENDED OR FORMULATED MILLIONS OF POUNDS OF PESTICIDES AT THE FORMULATION PLANT LOCATED ON THE FARM CHEMICALS AREA. THOSE COMPANIES WERE TAYLOR CHEMICAL COMPANY (MID-1930'S UNTIL 1964), GROWER SERVICE CORPORATION (1964-71), AND FARM CHEMICALS, INC. (1972-87). THOSE COMPANIES REFORMULATED, OR BLENDED, OR DILUTED TECHNICAL GRADE PESTICIDES (GENERALLY PURE OR NEARLY PURE PESTICIDES) INTO COMMERCIAL GRADE FINISHED PESTICIDE PRODUCTS FOR AGRICULTURAL USE. THOSE COMPANIES FORMULATED FINISHED, COMMERCIAL GRADE PESTICIDES AS THEIR OWN PRODUCTS UNDER THEIR OWN LABELS (SUCH AS "SUPERKILL" FOR TAYLOR CHEMICAL).

TAYLOR CHEMICAL, GROWER SERVICE AND FARM CHEMICALS ALSO FORMULATED FINISHED, COMMERCIAL GRADE PESTICIDE PRODUCTS FOR OTHER COMPANIES. IT WAS AND IS COMMON IN THE PESTICIDE INDUSTRY FOR MANUFACTURERS OF TECHNICAL GRADE PESTICIDES FOR VARIOUS BUSINESS REASONS (INCLUDING TRANSPORTATION AND PRODUCTION COSTS) TO CONTRACT WITH PESTICIDE MANUFACTURERS FOR THE

FORMULATION OF FINISHED, COMMERCIAL GRADE PESTICIDES FOR THE MANUFACTURERS. THE COMPANIES FOR WHOM TAYLOR CHEMICAL, GROWER SERVICE OR FARM CHEMICALS FORMULATED FINISHED PESTICIDE PRODUCTS WOULD FURNISH AND RETAIN OWNERSHIP OF THE TECHNICAL GRADE PESTICIDES THROUGHOUT THE FORMULATION AND PACKAGING PROCESS.

TAYLOR CHEMICAL COMPANY WAS ONE OF THE LARGEST FORMULATORS IN THE SOUTHEAST DURING ITS OPERATION. TAYLOR CHEMICAL FORMULATED COTTON DUST AND OTHER PRODUCTS FOR DUPONT, OLIN-MATHIESON (A PREDECESSOR OF OLIN CORP.), COLUMBIA SOUTHERN OR COLUMBIA CHEMICALS (A PREDECESSOR OF PPG INDUSTRIES), AND HOWERTON GOWAN CHEMICAL CO. (A PREDECESSOR OF UCI HOLDINGS, INC.). TAYLOR CHEMICAL WAS LIQUIDATED AND DISSOLVED AFTER IT CEASED ITS FORMULATION OPERATIONS IN 1964.

GROWER SERVICE WAS A SUBSIDIARY OF UNION CARBIDE CORPORATION DURING THE TIME (1964-72) THAT IT OWNED AND OPERATED THE FORMULATION PLANT LOCATED ON THE FARM CHEMICALS AREA. GROWER SERVICE FORMULATED MILLIONS OF POUNDS OF FINISHED "SEVIN" PRODUCTS FOR UNION CARBIDE. GROWER SERVICE CONTINUED WITHOUT SUBSTANTIAL OPERATIONAL CHANGE THE PESTICIDE FORMULATION OPERATIONS OF TAYLOR CHEMICAL. GROWER SERVICE CONTINUED TO FORMULATE COMMERCIAL GRADE PESTICIDES IN LIQUID, DUST AND GRANULAR FORM.

IN 1972 FARM CHEMICALS BOUGHT THE FORMULATION PLANT FROM GROWER SERVICE. FARM CHEMICALS CONTINUED TO FORMULATE LIQUID PESTICIDES, BUT STOPPED BLENDING PESTICIDE DUSTS AND POWDERS. FARM CHEMICALS FORMULATED FINISHED PESTICIDE PRODUCTS FOR SHELL, AND BOOTS-HERCULES AGROCHEMICALS COMPANY (A JOINT VENTURE BETWEEN HERCULES, INC. AND THE BOOTS COMPANY (USA), INC.) AND/OR BFC (A PREDECESSOR OF NOR-AM). IN 1987, FARM CHEMICALS ENTIRELY STOPPED ITS PESTICIDE BLENDING OPERATIONS AT THE ABERDEEN PLANT AND ABANDONED THAT FACILITY.

PESTICIDES IN TECHNICAL GRADE STRENGTH ARE NOT USABLE FOR AGRICULTURAL USE BY FARMERS WITHOUT FORMULATION OR BLENDING INTO A DILUTED FORM. THE PESTICIDE FORMULATION OR BLENDING PROCESS GENERATES A LARGE QUANTITY OF WASTES CONTAINING PESTICIDES, INCLUDING BAGS AND DRUMS CONTAINING RESIDUES OF TECHNICAL GRADE PESTICIDES, AND ALSO RESULTS IN SPILLS AND RELEASES OF PESTICIDES INTO THE AIR AND SOILS. EXTREMELY HIGH LEVELS OF PESTICIDE CONTAMINATION HAVE BEEN CONFIRMED AROUND THE FORMULATION BUILDINGS AND LOADING DOCKS OF THOSE FORMULATION BUILDINGS AND WAREHOUSES. THE GENERATION, DISPOSAL AND RELEASE OF WASTES CONTAINING PESTICIDES AND PESTICIDE CONSTITUENTS THROUGH SPILLS, DISCHARGES, CLEANING OF FORMULATING AND STORAGE BUILDINGS AND EQUIPMENT, BLENDING AND FORMULATION OPERATIONS AND PROCESSES (SUCH AS MIXING AND GRINDING), PRODUCTION OF BATCHES THAT DO NOT MEET SPECIFICATIONS, PACKAGING, LOADING, UNLOADING AND MOVEMENT OF TECHNICAL GRADE AND COMMERCIAL PESTICIDES, DISPOSAL OF USED TECHNICAL GRADE PESTICIDE BAGS, DRUMS AND OTHER CONTAINERS, CLEANING OF USED METAL TECHNICAL GRADE PESTICIDE DRUMS, AND OTHER MEANS WAS INHERENT IN AND INCIDENT TO THE PESTICIDE FORMULATION AND PACKAGING PROCESS CONDUCTED AT THE FARM CHEMICALS AREA BY TAYLOR CHEMICAL, GROWER SERVICE AND FARM CHEMICALS.

THE THREE FORMULATOR COMPANIES RECEIVED TECHNICAL GRADE PESTICIDES IN POWDER, LIQUID OR SOLID FORM FROM THE PESTICIDE MANUFACTURERS, AND THEN BLENDED OR FORMULATED THOSE TECHNICAL GRADE PESTICIDES INTO COMMERCIAL GRADE PESTICIDE PRODUCTS IN LIQUID, POWDER, DUST AND/OR GRANULE FORM. FOR LIQUID COMMERCIAL PRODUCTS, THE FORMULATORS MIXED THE TECHNICAL GRADE PESTICIDE IN A LARGE VAT WITH SOLVENTS AND EMULSIFIERS. FOR POWDER OR DUST COMMERCIAL PRODUCTS, THE FORMULATORS MIXED THE TECHNICAL GRADE PESTICIDE WITH INERT FILLERS (SUCH AS CLAY) IN LARGE MIXERS SIMILAR TO CONCRETE MIXERS. FOR GRANULAR COMMERCIAL PRODUCTS, THE FORMULATORS APPLIED THE TECHNICAL GRADE PESTICIDE IN LIQUID FORM TO GRANULES IN MIXERS.

DURING AND AS AN INTEGRAL PART OF THEIR PESTICIDE FORMULATION OPERATIONS ON THE FARM CHEMICALS AREA, TAYLOR CHEMICAL, GROWER SERVICE AND FARM CHEMICALS BURIED, DISPOSED OF OR SPILLED SUBSTANTIAL QUANTITIES OF WASTES CONTAINING LIQUID AND DUST PESTICIDES AT THAT AREA. THOSE BURIED WASTES INCLUDED EMPTY TECHNICAL GRADE BAGS AND CONTAINERS, SPILL CLEANUP MATERIALS, AND BROKEN BAGS OF FINISHED PESTICIDE PRODUCTS. SEVERAL PESTICIDE WASTE DISPOSAL HOLES ARE LOCATED ON THAT AREA. IN ADDITION, RELEASES OF PESTICIDES ONTO THE GROUND OCCURRED DURING THE STEAM CLEANING OF METAL DRUMS THAT HAD CONTAINED TECHNICAL GRADE PESTICIDES. THE METAL DRUMS WERE STEAM-CLEANED DIRECTLY OVER THE GROUND WITHIN THE PLANT AREA.

THE PESTICIDE FORMULATION PROCESS ITSELF ALSO UNAVOIDABLY RESULTED IN SPILLS AND OTHER RELEASES

OF BOTH TECHNICAL GRADE AND FINISHED PESTICIDES. SPILLS AND RELEASES OF PESTICIDES OCCURRED DURING LOADING, UNLOADING AND INTRA-PLANT TRANSPORT OF BOTH TECHNICAL GRADE AND FINISHED PESTICIDES, AS BAGS AND OTHER CONTAINERS WERE INADVERTENTLY TORN OR OPENED SO THAT PESTICIDES WERE RELEASED ONTO THE GROUND. SPILLS AND RELEASES ALSO OCCURRED DURING THE FORMULATION PROCESS ITSELF. THE DUST OR POWDER BLENDING PROCESS REQUIRED CUTTING OR TEARING OPEN BAGS OF TECHNICAL GRADE PESTICIDES, DUMPING THE PESTICIDES ALONG WITH INERT CARRIERS (SUCH AS CLAY) INTO A MIXER, AND BAGGING THE BLENDED FINISHED PRODUCT. FURTHER SPILLS OCCURRED DURING CLEANUP OF BUILDINGS AND EQUIPMENT.

SPILLS AND RELEASES ALSO OCCURRED DURING THE LIQUID FORMULATION PROCESS. TECHNICAL GRADE PESTICIDES AND APPROPRIATE OTHER INGREDIENTS (INCLUDING SOLVENTS, SOME OF WHICH, SUCH AS XYLENE, WERE THEMSELVES HAZARDOUS SUBSTANCES) WERE BLENDED IN LARGE MIXING VATS. SPILLS AND RELEASES OCCURRED DURING THE BLENDING PROCESS. THE CONCRETE FLOOR OF THE OPEN-SIDED LIQUID FORMULATION BUILDING WAS COVERED WITH PESTICIDES DURING PERIODS OF FORMULATION. THOSE PESTICIDES FREQUENTLY SPILLED OVER ONTO THE GROUND. IN ADDITION, PESTICIDES WERE SPILLED OR RELEASED ONTO THE GROUND DURING CLEANING OF THE LIQUID FORMULATION EQUIPMENT. THE LIQUID BUILDING AND ITS BLENDING VAT WERE REGULARLY CLEANED WITH XYLENES, WHICH ARE HAZARDOUS SUBSTANCES. THE RESULTING MIXTURE OF PESTICIDES AND XYLENES EITHER RAN OFF ONTO THE GROUND OR WAS PLACED INTO A DISPOSAL PIT ON THE FARM CHEMICALS AREA.

DURING THE SITE RECONNAISSANCE CONDUCTED BY EPA'S REMEDIAL CONTRACTOR, THE REM V TEAM, SULFUR AND POSSIBLY PESTICIDE-LIKE ODORS WERE NOTICED ON SITE. CRYSTALLIZED FINGER-SHAPED SUBSTANCES (PRESUMED TO BE PESTICIDE) WITH YELLOWISH OR BLACK TIPS WERE FOUND ON SITE. THE CHEMICALS OR MATERIALS WERE SIMILAR TO THOSE IDENTIFIED AT THE TWIN SITES AREA ACROSS THE STREET FROM THE FARM CHEMICALS AREA.

BETWEEN MAY 11-16, 1986, HIGH FREQUENCY GROUND PENETRATING RADAR (GPR), TERRAIN CONDUCTIVITY, AND MAGNETIC FIELD SURVEYS WERE CONDUCTED ON THE SOUTHERN PORTION OF THE PLANT. THE GPR PROFILES INDICATED THE PRESENCE OF AN EXTENSIVE TRENCH SYSTEM UNDERLYING THE SOUTHERN PORTION OF THE FARM CHEMICALS' PROPERTY. LOW TERRAIN CONDUCTIVITY MEASUREMENTS OVER THE TRENCH AREA SUGGESTED NONCONDUCTIVE TRENCH CONTENTS, I.E., PAPER, PLASTIC, AND DRUMS. AUGERING CONFIRMED THE NATURE OF THE TRENCH CONTENTS AND SUBSEQUENT ANALYSIS OF SUBSURFACE MATERIAL REVEALED CONTAMINATION BY SEVERAL PESTICIDES AND PCBS. SCATTERED SPOTS OF MAGNETIC FIELD ANOMALIES WERE ALSO DETECTED, POSSIBLY INDICATING THE PRESENCE OF BURIED METALLIC OBJECTS (EPA-TAT, JULY 1986).

THE GPR SURVEY WAS EXTENDED ONTO THE BROOKS-PERKINS PROPERTY SOUTH OF AND IMMEDIATELY BEHIND FARM CHEMICALS' PROPERTY. THIS SURVEY IDENTIFIED A POSSIBLE TRENCH LIKE STRUCTURE ALONG WITH SEVERAL BURIED DRUM LIKE OBJECTS. TERRAIN CONDUCTIVITY AND MAGNETIC FIELD SURVEYS WERE NOT CONDUCTED TO VERIFY THE GPR FINDINGS DUE TO TIME CONSTRAINTS. IT WAS RECOMMENDED AT THE CONCLUSION OF THE GPR SURVEY THAT ADDITIONAL DATA BE COLLECTED TO VERIFY THE FINDINGS (EPA-TAT, JULY 1986).

FOUR SOILS SAMPLES FROM THE SOUTHERN PART OF THE FARM CHEMICALS' PROPERTY AND THE ADJACENT BROOKS-PERKINS PROPERTY WERE COLLECTED AND ANALYZED. A SOIL SAMPLE COLLECTED AT A DEPTH OF 7 FEET ON THE FARM CHEMICALS' PROPERTY CONFIRMED THE PRESENCE OF A BURIED TRENCH WITH CONTAMINATION LEVELS OF 800 PPM 4,4'-DDT AND 100 PPM PCBS.

#### 2.1.2 TWIN SITES AREA

TAYLOR CHEMICAL USED THE TWIN SITES AREA AS A DISPOSAL AREA FOR USED TECHNICAL GRADE PESTICIDE BAGS AND OTHER CONTAINERS AT LEAST FROM 1945 THROUGH 1949. DURING THOSE YEARS, TAYLOR CHEMICAL FORMULATED COTTON DUST FOR ITSELF, AS WELL AS OLIN-MATHIESON, DUPONT AND COLUMBIA SOUTHERN OR COLUMBIA CHEMICAL. THE TECHNICAL GRADE INGREDIENTS FOR THE COTTON DUST FORMULATED BY TAYLOR CHEMICAL DURING THOSE YEARS WERE DDT AND BENZENE HEXACHLORIDE OR BHC. SIGNIFICANT CONCENTRATIONS OF DDT AND BHC HAVE BEEN FOUND AT THE TWIN SITES AREA. THE USED TECHNICAL GRADE PESTICIDE BAGS AND CONTAINERS DISPOSED OF BY TAYLOR CHEMICAL CONTAINED RESIDUAL AMOUNTS OF PESTICIDES. GROWER SERVICE CONTINUED TO USE THE TWIN SITES AREA FOR DISPOSAL OF LIQUID PESTICIDE WASTES AT TIMES DURING THE YEARS FROM 1964 THROUGH 1971. THE RI/FS SHOWS THAT A PLUME OF CONTAMINATED GROUNDWATER ORIGINATING FROM THE FARM CHEMICALS AREA FLOWS UNDERNEATH THE TWIN SITES AREA.

THE NORTH CAROLINA STATE DIVISION OF HIGHWAYS REPORTED THE FIRST DISPOSAL AREA DISCOVERED AT THE TWIN SITES AREA TO THE NC SHWMB IN JULY 1984. NC SHWMB PERFORMED INVESTIGATIVE WORK IN AUGUST 1984, AND LEARNED OF ANOTHER NEARBY DISPOSAL AREA THROUGH AN EMPLOYEE OF THE TOWN OF ABERDEEN. A THIRD DISPOSAL AREA WAS SUSPECTED AND SUBSEQUENTLY CONFIRMED DURING THE REMEDIAL INVESTIGATION. WASTE TYPES AND DISPOSAL METHODS ARE SIMILAR FOR ALL AREAS. THE DISPOSAL AREAS WILL BE REFERRED TO INDIVIDUALLY WHEN NECESSARY AS AREA A, AREA B, AND AREA C. TAYLOR CHEMICALS COMPANY, THE NAME PRINTED ON TOXAPHENE BAGS FOUND ON SITE, INDICATES THAT IT IS POSSIBLE THAT DISPOSAL ACTIVITIES MAY DATE BACK AS EARLY AS 1936.

ON OCTOBER 22, 1984, RCRA 3012 PERSONNEL OF THE NC SHWMB CONDUCTED A SITE INVESTIGATION AT THE TWIN SITES AREA. PESTICIDES BAGS AND COLORED POWDERY MATERIAL (BELIEVED TO BE PESTICIDES) LAY STREWN OVER AREAS A AND B. STRONG ODORS WERE NOTICED DURING THE INVESTIGATION. THE MODERATELY SLOPING TERRAIN HAS FACILITATED CONSIDERABLE CONTAMINANT RUN-OFF IN THE DIRECTION OF PAGES LAKE. SAMPLES OF THE WASTES AND SOIL WERE COLLECTED FROM AREAS A AND B. LABORATORY ANALYSES SHOWED THE PRESENCE OF DDD, DDT, TOXAPHENE, ALDRIN, HEPTACHLOR, LINDANE, DIELDRIN, AND LEAD.

DURING THE SITE RECONNAISSANCE BY THE REM V TEAM AND EPA PERSONNEL ON OCTOBER 26, 1987, A THIRD AREA (HEREINAFTER KNOWN AS AREA C) OF POSSIBLE PESTICIDE DISPOSAL WAS FOUND BETWEEN DISPOSAL AREAS A AND B. SULFUR- AND POSSIBLY PESTICIDE-LIKE ODORS WERE NOTICED. CRYSTALLIZED FINGER-SHAPED SUBSTANCES (PRESUMED TO BE PESTICIDES) WITH YELLOWISH OR BLACK TIPS WERE FOUND THROUGHOUT THE THREE DISPOSAL AREAS.

IN 1985, EPA INITIATED AN EMERGENCY RESPONSE CLEANUP AT THE TWIN SITES AREA DURING THE PERIODS OF JUNE 17TH THROUGH THE 24TH AND JULY 30TH THROUGH AUGUST 5TH. SEVENTY-ONE TRUCK LOADS OF SURFACE CONTAMINANTS CONTAINING PESTICIDES AND CONTAMINATED SOIL WERE EXCAVATED FROM AREA B. AFTER PARTIAL EXCAVATION OF AREA A, AN APPROXIMATELY 200' X 20' X 10' DEEP TRENCH CONTAINING PESTICIDE WASTES (CONCENTRATIONS UP TO 1,000 PPM) WAS IDENTIFIED. A TOTAL OF 165 TRUCK LOADS OF PESTICIDE WASTE WERE EXCAVATED FROM AREA A. CONTAMINANTS FROM THE TWIN SITES AREA WERE SHIPPED TO THE GSX FACILITY AT PINWOOD, SOUTH CAROLINA FOR DISPOSAL.

DURING THE SITE RESTORATION, ABOUT 6,500 CUBIC YARDS OF ADDITIONAL PESTICIDE WASTES WERE DISCOVERED IN AREA A. SINCE THESE WASTES DID NOT APPEAR TO POSE AN IMMEDIATE THREAT, THEY WERE NOT EXCAVATED AS A PART OF THE EMERGENCY RESPONSE CLEANUP.

CONTAMINATION DETECTED IN 4 MUNICIPAL WELLS AND 3 PRIVATE WELLS CAUSED THE EPA TO REEVALUATE THE TWIN SITES AREA IN MAY 1986. GEOPHYSICAL SURVEYS (GROUND PENETRATING RADAR (GPR), TERRAIN CONDUCTIVITY, AND MAGNETOMETER) AND LIMITED GROUNDWATER AND SOIL SAMPLING WERE CONDUCTED BETWEEN MAY 11-16, 1986 AT AND AROUND AREA A TO IDENTIFY AND DELINEATE POTENTIAL CONTAMINATION SOURCES.

THESE SURVEYS SUGGESTED THAT NO SUBSTANTIAL TRENCH STRUCTURES OR SUBSURFACE METALLIC DEBRIS REMAINED IN AREA A AFTER THE 1985 EMERGENCY CLEANUP ACTIVITIES. TERRAIN CONDUCTIVITY FINDINGS DID INDICATE THE EXISTENCE OF A RESIDUAL CONTAMINANT PLUME. A GROUNDWATER SAMPLE, TAKEN FROM THE TOP OF THE WATER TABLE (13 FEET BELOW THE SURFACE) NEAR THE CENTER OF AREA A, CONFIRMED THIS CONTAMINATION. CONCENTRATIONS OF UP TO 76.6 PPB OF LINDANE WERE REPORTED. SOIL SAMPLES SHOWED THE AREA JUST WEST OF AREA A TO BE FREE OF PESTICIDE CONTAMINATION, HOWEVER SAMPLES COLLECTED AT THE NORTHERN EDGE OF THE EXCAVATED AREA (DEPTHS OF 11 AND 4-6 FEET) REVEALED THAT EXTENSIVE CONTAMINATION STILL EXISTED ON THE AREA. CONCENTRATIONS OF UP TO 19 PPM LINDANE AND NEARLY 300 PPM FOR THE OTHER BHC ISOMERS WERE REPORTED ALONG WITH ELEVATED LEVELS OF DDT, DDD, DDE, ALDRIN, HEPTACHLOR, ENDRIN KETONE, AND CHLORDANE.

AN ADDITIONAL GEOPHYSICAL INVESTIGATION WAS CONDUCTED WITH AN EM-31 TERRAIN CONDUCTIVITY METER DURING MARCH 1987. OTHER THAN SOME RESIDUAL CONTAMINATION, NO NEW PESTICIDE DEPOSITS WERE FOUND DURING THIS SURVEY (ROY F. WESTON, INC., NO DATE). THE AREA COVERED BY THE SURVEY IS UNKNOWN.

#### 2.1.3 FAIRWAY SIX AREA

THE FAIRWAY SIX AREA WAS USED AS A DISPOSAL AREA FOR USED TECHNICAL GRADE PESTICIDE CONTAINERS (BAGS AND CARDBOARD CONTAINERS) BY TAYLOR CHEMICAL AND GROWER SERVICE FROM 1950 UNTIL 1972. TAYLOR CHEMICAL USED THE FAIRWAY SIX AREA AS ITS EXCLUSIVE DISPOSAL AREA FOR USED TECHNICAL GRADE PESTICIDE BAGS AND CONTAINERS FROM 1950 THROUGH 1964, WHEN IT SOLD THE PLANT TO GROWER

SERVICE. THOSE BAGS AND CONTAINERS CONTAINED RESIDUAL AMOUNTS OF PESTICIDES. THAT PERIOD OF DISPOSAL AT THE FAIRWAY SIX AREA INCLUDES THE YEARS THAT TAYLOR CHEMICAL FORMULATED COMMERCIAL GRADE PESTICIDE PRODUCTS FOR DUPONT, OLIN-MATHIESON, COLUMBIA SOUTHERN OR COLUMBIA CHEMICALS AND HOWERTON GOWAN. GROWER SERVICE CONTINUED TAYLOR CHEMICAL'S PRACTICE OF USING THE FAIRWAY SIX AREA FOR DISPOSAL OF MOST OF ITS USED TECHNICAL GRADE PESTICIDE BAGS AND CONTAINERS. THAT PERIOD OF DISPOSAL AT THE FAIRWAY SIX AREA INCLUDES THE YEARS THAT GROWER SERVICE FORMULATED SEVIN PRODUCTS FOR UNION CARBIDE.

THE DISPOSAL PRACTICE OF TAYLOR CHEMICAL AND GROWER SERVICE DURING THE YEARS FROM 1950 THROUGH 1971 WAS TO TIE THE USED TECHNICAL GRADE PESTICIDE BAGS INTO BUNDLES, TRANSPORT THEM BY TRUCK, (UP TO SEVERAL TRIPS PER WEEK) UP HIGHWAY 5 TO THE FAIRWAY SIX DISPOSAL AREA, AND SPREAD THE USED BAGS OVER A CLEARED LOCATION. TAYLOR CHEMICAL STATED THAT IT SPREAD THE BAGS OVER SUCH A LARGE AREA IN AN EFFORT TO "NEUTRALIZE" THE RESIDUAL PESTICIDES IN THE BAGS THROUGH DECOMPOSITION OF THE BAGS AND PESTICIDES AS A RESULT OF THEIR EXPOSURE TO SUNLIGHT. OVER THOSE YEARS, TAYLOR CHEMICAL AND GROWER SERVICE DISPOSED OF THOUSANDS OF USED TECHNICAL GRADE PESTICIDE BAGS OVER A LOCATION COVERING IN EXCESS OF AN ACRE AT THE FAIRWAY SIX AREA.

DURING 1972, YADCO OF PINEHURST ACQUIRED THE FAIRWAY SIX AREA AND OTHER REAL PROPERTY IN THE VICINITY OF THAT AREA. IN 1984, PARTNERS IN THE PITS ACQUIRED PART OF THE FAIRWAY SIX AREA; THE REMAINDER OF THIS AREA IS STILL OWNED BY YADCO. PARTNERS IN THE PITS AND OTHERS THEN DEVELOPED AND CONSTRUCTED THE PITS GOLF COURSE. PART OF THE FAIRWAY SIX AREA LIES ON THE SIXTH FAIRWAY OF THAT COURSE.

NC SHWMB PERSONNEL DISCOVERED THE SITE IN AUGUST 1984 THROUGH AN EMPLOYEE OF THE TOWN OF ABERDEEN, WHO INDICATED THAT PESTICIDE WASTES HAD BEEN DISPOSED OF AT AND AROUND THE AREA FROM TIME TO TIME FOR A NUMBER OF YEARS.

ON OCTOBER 22, 1984, RCRA 3012 PERSONNEL OF THE NC SHWMB CONDUCTED A SITE INVESTIGATION AT THE FAIRWAY SIX AREA. DURING THE INVESTIGATION, HOUSEHOLD RUBBISH, OLD CAR PARTS, ETC., WERE OBSERVED WITHIN THE VICINITY OF THE AREA. THE GENERAL AREA, THEREFORE, IS BELIEVED TO HAVE SERVED AS A TRASH DUMP FOR MANY YEARS PRIOR TO THE CONSTRUCTION OF THE "PIT" GOLF COURSE. RECORDS OF WASTE DISPOSAL ACTIVITY DO NOT EXIST. SEVERAL PESTICIDE BAGS WERE NOTED, AS WERE COLORED POWDERS AND FINES BELIEVED TO BE WASTE CHEMICALS, POSSIBLY PESTICIDES. THE MOST PREVALENT INDICATION OF PESTICIDES, HOWEVER, WAS STRONG CHEMICAL ODOR. SAMPLES OF THESE WASTES AND SOILS WERE COLLECTED IN OCTOBER 1984 BEFORE EPA'S EMERGENCY REMOVAL ACTION AND SUBSEQUENT ANALYSIS REVEALED THE PRESENCE OF 2,253 PPM DDT, 573 PPM DDD, 601 PPM TOXAPHENE, AND TRACES OF LINDANE.

EPA INITIATED AN EMERGENCY RESPONSE ACTION AT THE AREA ON JUNE 25, 1985. THE MATERIALS ON THE SURFACE AND IN TRENCH NO. 1 (FIGURE 4), WERE EXCAVATED AND TRANSPORTED TO THE GSX FACILITY IN PINWOOD, SOUTH CAROLINA FOR DISPOSAL. DURING THE SITE RESTORATION, TRENCH NO. 2 WAS DISCOVERED, EXCAVATED, AND THE MATERIAL WAS ALSO SHIPPED TO THE GSX FACILITY.

EMERGENCY RESPONSE ACTIONS AT THE FAIRWAY SIX AREA INITIALLY TERMINATED ON JULY 16, 1985. AS A RESULT OF THE IDENTIFICATION OF PESTICIDE CONTAMINATION IN THE DRINKING WATER IN 4 MUNICIPAL WELLS AND 3 PRIVATE WELLS, THE EPA REEVALUATED THE FAIRWAY SIX AREA IN MAY 1986. GROUND PENETRATING RADAR (GPR), TERRAIN CONDUCTIVITY, AND SOIL SAMPLING (4 STATIONS) STUDIES WERE CONDUCTED AT THE AREA DURING MAY 11-16, 1986. THE GEOPHYSICAL SURVEYS REVEALED A THIRD BURIED TRENCH RANGING IN DEPTH FROM 4 TO 10 FEET AND CONTAINING HIGHLY CONDUCTIVE MATERIAL. EXPLORATORY AUGERING AND SAMPLING VERIFIED THE PRESENCE OF PESTICIDE CONTAMINATION UP TO 1,500 PPM. TRENCH NO. 3 WAS ESTIMATED TO CONTAIN 12 MILLION POUNDS OF PESTICIDE WASTES.

DURING DECEMBER 10-12, 1986, THE EPA EMERGENCY RESPONSE TEAM CONDUCTED A TEST BURN OF CONTAMINATED SOIL AT THE AREA. TWELVE THOUSAND POUNDS OF MATERIAL WERE INCINERATED IN AN 8-MILLION BTU ROTARY KILN MOBILE INCINERATOR OWNED AND OPERATED BY VESTA TECH LTD. CONTAMINATED DISPOSABLE SUPPLIES AND INCINERATOR RESIDUE WERE STORED IN 55-GALLON DRUMS ON-SITE. AN EPA TECHNICAL ASSISTANCE TEAM CONDUCTED ANOTHER GEOPHYSICAL SURVEY WITH AN EM-31 TERRAIN CONDUCTIVITY METER AT THE AREA ON MARCH 10, 1987. DURING THIS INVESTIGATION, THE FOURTH PESTICIDE TRENCH WAS DISCOVERED WITH PESTICIDE CONTAMINATION LEVELS UP TO 1,500 PPM.



EXCAVATION OF THE MOST RECENTLY DISCOVERED PESTICIDE WASTES (IN TRENCH NOS. 3 AND 4) BEGAN IN AUGUST 1988. DURING THIS ACTIVITY, TWO ADDITIONAL PESTICIDE WASTE TRENCHES WERE DISCOVERED, TRENCH NOS. 5 AND 6. THIS MATERIAL WAS EXCAVATED, SCREENED, AND STOCKPILED ADJACENT TO THE AREA. THE STOCKPILE IS ISOLATED FROM THE ENVIRONMENT WITH BOTH BOTTOM AND TOP LINERS OF 30-MIL PVC PLASTIC. THESE LINERS WERE CHEMICALLY AFFIXED TO PREVENT MIGRATION OF THIS MATERIAL FROM THE STOCKPILE, WHILE THE TOP LINER WAS ALSO WEIGHED DOWN BY RUBBER TIRES.

THE STOCKPILE AREA WAS ENCLOSED BY A 6-FOOT FENCE WITH A LOCKED GATE ON THE WEST SIDE NEAR THE NORTHWEST CORNER. THE DIMENSIONS OF THE PILE ARE ROUGHLY 215' X 110' X 28'. IT IS ESTIMATED TO CONTAIN ABOUT 22,000 CUBIC YARDS OF PESTICIDE-CONTAMINATED MATERIALS. THE WASTE PILE WAS DESIGNATED AS OPERABLE UNIT TWO (OU TWO) WITHIN THE OVERALL SITE STRATEGY FOR THE ABERDEEN PESTICIDE DUMPS SITE.

FROM MARCH 30, 1989 TO MAY 14, 1989, A REM V REMEDIAL INVESTIGATION TEAM CONDUCTED A FEASIBILITY STUDY ON OU TWO. A RECORD OF DECISION WAS SIGNED ON JUNE 30, 1989. THE SELECTED REMEDY INCLUDED ON-SITE INCINERATION AND ON-SITE DISPOSAL OF THE RESIDUAL ASH. A POTENTIALLY RESPONSIBLE PARTY (PRP) HAS AGREED TO IMPLEMENT THE REMEDY. HOWEVER, FIELD ACTIVITY HAS BEEN POSTPONED PENDING THE OUTCOME OF THE REMEDY SELECTION FOR OPERABLE UNIT ONE. THE PRP WILL UNDERTAKE MEASURES TO ENSURE LINER INTEGRITY OF THE SOIL STOCKPILE DURING THIS PERIOD UNTIL FIELD ACTIVITIES BEGIN.

#### 2.1.4 MCIVER DUMP AREA

DURING THE YEARS FROM APPROXIMATELY 1948 THROUGH 1952, GEIGY CHEMICAL COMPANY TRUCKS DISPOSED OF WASTES CONTAINING PESTICIDES AT THE MCIVER DUMP AREA. THOSE GEIGY TRUCKS WERE DISPOSING OF WASTES FROM THE GEIGY PESTICIDE FORMULATING PLANT THAT WAS ALSO LOCATED IN ABERDEEN, NORTH CAROLINA. THAT GEIGY PLANT IS ITSELF ANOTHER SUPERFUND SITE; IT IS NOT PART OF THE ABERDEEN PESTICIDE DUMPS SITE. THE GEIGY PLANT DURING THOSE YEARS FORMULATED PESTICIDES THAT CONTAINED DDT, BHC, TOXAPHENE AND OTHER ACTIVE INGREDIENTS. THE MCIVER DUMP AREA IS CONTAMINATED WITH DDT, BHC AND TOXAPHENE.

THE MCIVER DUMP AREA WAS DISCOVERED IN NOVEMBER 1984 WHEN NC DEPARTMENT OF AGRICULTURE (NCDA) PERSONNEL FOUND 200-300 55-GALLON PESTICIDE DRUMS DUMPED IN A RUBBLE LANDFILL (KNOWN AS "LUCKS LANDFILL" AND AREA A) FURTHER INVESTIGATION REVEALED THAT PESTICIDE RESIDUES REMAINED IN AT LEAST SOME OF THE DRUMS.

DURING THE INITIAL INVESTIGATIONS BY THE NC SHWMB, A SECOND AREA (AREA B, PREVIOUSLY KNOWN AS THE BAG SITE) WAS DISCOVERED APPROXIMATELY 1,000 FEET TO THE NORTHWEST OF AREA A. AREA B CONSISTS OF AN APPROXIMATELY ONE-ACRE TRACT WHERE TRASH, OLD BUILDING MATERIALS, AND A LARGE NUMBER OF BAGS CONTAINING PESTICIDES AND PESTICIDE RESIDUE HAD BEEN DUMPED. THE BAGS WERE ALLEGEDLY DISPOSED BY GEIGY CHEMICAL, WHO ONCE HAD OPERATED A PESTICIDE FORMULATION PLANT IN ABERDEEN, LOCATED ALONG ROUTE 211. THE DISPOSAL DATES ARE ESTIMATED TO BE LATE 1960S TO EARLY 1970S.

THE PROPERTY ON WHICH THE SITE LIES IS OWNED BY THE ESTATE OF REV. MARY E. AND JOHN MCIVER. THEIR HEIRS INCLUDE REV. RUTH MONROE, WHO LIVES ABOUT 1,000 FEET FROM THE SITE. PART OF THE PROPERTY WAS LEASED BY BILL LUCK, AND IS KNOWN AS "LUCK'S LANDFILL." ACCORDING TO REV. MONROE, AREA A HAD BEEN USED FOR AN UNDETERMINED NUMBER OF YEARS AS A RUBBLE DUMP. ACCESS TO THIS AREA WAS NOT CONTROLLED. ALTHOUGH SEVERAL CONTRACTORS APPARENTLY USED THE SITE TO DUMP RUBBLE, BILL LUCK SEEMS TO HAVE BEEN THE PRIMARY USER. AREA A WAS INVESTIGATED AFTER IT WAS DISCOVERED THAT 200 TO 300 PESTICIDE DRUMS HAD BEEN DUMPED THERE. APPARENTLY NO ENVIRONMENTALLY RELATED PERMITS WERE OBTAINED FOR THE AREA DURING ITS USE.

IN JANUARY 1985 FARM CHEMICALS, INC., BILL LUCK AND LUCK'S CONSTRUCTION COMPANY AGREED TO REMEDIATE AREA A IN ACCORDANCE WITH A STATE ISSUED ADMINISTRATIVE ORDER. THE REMEDIATION CONSISTED OF THE FOLLOWING:

- REMOVAL OF 686 DRUMS. DRUMS WERE TRIPLE-RINSED, CRUSHED AND DISPOSED OF IN THE MOORE COUNTY LANDFILL.

- FIVE OF THE 686 DRUMS HAD LIQUID IN THEM. THREE OF THESE RUPTURED DURING THE REMOVAL. AS A RESULT, CONTAMINATED SOIL WAS REMOVED FROM THIS AREA.
- POST-REMOVAL SOIL SAMPLING AND ANALYSIS INDICATED THAT PARATHION REMAINED IN THE SOIL. CONFIRMATION SAMPLING INDICATED TWO AREAS WERE CONTAMINATED AT DEPTHS UP TO 24 INCHES.
- FARM CHEMICALS THEN REMOVED 2 TO 2.5 FEET OF SOIL IN THOSE AREAS AND BACK FILLED THE HOLES WITH CLEAN FILL.

REPRESENTATIVES OF NORTH CAROLINA DEPARTMENT OF HUMAN RESOURCES OVERVIEWED THE REMOVAL ACTIVITIES AT AREA A AND DETERMINED THAT AREA A OF THE SITE HAD BEEN REMEDIATED. AS A RESULT OF THESE ACTIONS, AND THE CONCURRENCE OF NORTH CAROLINA, EPA CONSIDERS AREA A TO BE COMPLETELY REMEDIATED. THEREFORE, EPA FOCUSED ITS REMEDIAL INVESTIGATION IN AREA B ONLY.

AREA B OF THE SITE IS PRESENTLY INACTIVE. ACCORDING TO REV. MONROE, DUMPING OCCURRED AT AREA B APPROXIMATELY 20 TO 30 YEARS AGO, WHEN PESTICIDE BAGS CONTAINING RESIDUES AND OLD PESTICIDES WERE SIMPLY DUMPED ON THE LAND SURFACE. ACCESS TO AREA B HAS REPORTEDLY NEVER BEEN CONTROLLED.

THE EPA INITIATED CLEANUP AND REMOVAL ACTIONS AT AREA B ON JUNE 10-16, 1985. IMMEDIATE REMOVAL ACTIVITY RESULTED IN DISPOSAL OF PESTICIDE WASTE AT THE GSX FACILITY IN PINWOOD, SOUTH CAROLINA.

IN MARCH OF 1989, DURING THE REMEDIAL FIELD INVESTIGATIONS, A NEW AREA OF DUMPED PESTICIDE-LIKE WASTES WAS DISCOVERED BETWEEN AREAS "A" AND "B". THE AREA, IDENTIFIED AS AREA C WAS APPROXIMATELY 75' X 300' AND HAD A STRONG CHEMICAL ODOR. THE WASTE MATERIAL (MOSTLY DECOMPOSED CARDBOARD DRUMS WITH FINE GRAINED WHITE TO LIGHT GRAYISH, AND SOME TARRY BLACK MATERIAL) ROSE 2 - 4 FEET ABOVE GROUND SURFACE. THE EDGE OF THE WASTES WAS WITHIN 50 FEET OF THE UNNAMED TRIBUTARY TO ABERDEEN CREEK WHICH LIES JUST NORTH OF AREA C. AN EPA EMERGENCY RESPONSE ACTION RESULTED IN THE EXCAVATION AND STOCKPILING OF APPROXIMATELY 3,200 CUBIC YARDS OF PESTICIDE WASTES AND CONTAMINATED SOIL. THE METHOD OF CONTAINMENT AND ISOLATION OF THE STOCKPILE (I.E. LINERS AND FENCE) WAS THE SAME AS WAS USED FOR THE STOCKPILE AT THE FAIRWAY SIX AREA.

#### 2.1.5 ROUTE 211 AREA

DURING THE YEARS FROM APPROXIMATELY 1950 THROUGH 1952, GEIGY CHEMICAL COMPANY USED THE ROUTE 211 AREA FOR DISPOSAL OF WASTES CONTAINING PESTICIDES. GEIGY DISPOSED OF WASTES FROM ITS PESTICIDE FORMULATING PLANT LOCATED IN ABERDEEN. THE GEIGY PLANT DURING THOSE YEARS FORMULATED PESTICIDES THAT CONTAINED DDT, BHC AND TOXAPHENE. THE MCIVER DUMP AREA IS CONTAMINATED WITH DDT, BHC AND TOXAPHENE.

PRIOR TO 1964, THE ROUTE 211 AREA WAS REPORTEDLY USED AS A SAND-MINING PIT BY SUPERIOR STONE COMPANY OF RALEIGH, NORTH CAROLINA. THE PERIOD DURING WHICH THE AREA WAS ACTIVELY MINED IS UNKNOWN AT THIS TIME. IN 1959, AMERICAN-MARIETTA PURCHASED BOTH THE ROUTE 211 AREA AND SUPERIOR STONE COMPANY. THE CURRENT LAND OWNER REPORTEDLY DISCOVERED THE WASTE PILE IN THE PIT SHORTLY AFTER PURCHASING THE PROPERTY IN 1964. HOWEVER, THE AREA APPEARS TO HAVE REMAINED UNCHANGED AND UNUSED SINCE THAT TIME.

THERE IS NO INDICATION THAT ANY REGULATORY ACTION HAD BEEN TAKEN AT THE AREA OR THAT ANY ENVIRONMENTALLY RELATED PERMITS HAVE BEEN ISSUED. ON JULY 12, 1985, NC SHWMB PERSONNEL INSPECTED THE AREA. IT APPEARED THAT WASTE HAD BEEN DUMPED IN A PILE ON THE SOUTHWEST SLOPE OF THE PIT. THE PILE CONTAINED DECOMPOSING CARDBOARD CONTAINERS, BAGS, AND WASTES RANGING FROM WHITE-TAN POWDERS TO DARK-BROWN TARRY RESIDUES. SAMPLES FROM THE PILE AND THE DOWNGRADIENT SOIL WERE COLLECTED. LABORATORY ANALYSES INDICATED THE PRESENCE OF ALPHA-, BETA-, AND DELTA-BHC, DDE, DDD, DDT, HEPTACHLOR, AND CHLORDANE. SOME OR ALL OF THESE COMPOUNDS WERE DETECTED IN SAMPLES TAKEN FROM THE WASTE PILE AND THE DOWNGRADIENT SURFACE SOIL.

EPA INITIATED AN EMERGENCY RESPONSE ACTION AT THE ROUTE 211 AREA BETWEEN JUNE 4-6, 1986. FIVE TRUCK LOADS OF SURFACE CONTAMINANTS OR APPROXIMATELY 100 CUBIC YARDS OF PESTICIDES AND CONTAMINATED SOIL WERE EXCAVATED FROM THE BASIN AND DISPOSED OF AT THE GSX FACILITY IN PINWOOD, SOUTH CAROLINA.

IN MAY 1989, DURING THE INSTALLATION OF MONITORING WELLS AROUND THE AREA, ABOUT 200 CUBIC YARDS OF MATERIAL WHICH APPEARED TO BE SIMILAR TO OTHER PESTICIDE WASTES FOUND AT THE AREA WERE DISCOVERED ON THE GROUND AND PARTIALLY BURIED IN A HILLSIDE ABOUT 100 YARDS NORTH OF THE AREA. THIS MATERIAL WAS REMOVED BY THE EPA'S EMERGENCY RESPONSE TEAM DURING JUNE 1989 AND STOCKPILED WITH THAT MATERIAL EXCAVATED FROM AREA C OF THE MCIVER DUMP AREA.

## 2.2 ENFORCEMENT ACTIVITIES

THE ABERDEEN PESTICIDES DUMPS SITE WAS PROPOSED FOR INCLUSION ON THE NATIONAL PRIORITIES LIST (NPL) IN JANUARY 1987 AND BECAME FINAL ON THE NPL AT 54 FED. REG. 13301 (MARCH 31, 1989). A POTENTIALLY RESPONSIBLE PARTY (PRP) SEARCH CONDUCTED IN 1985 IDENTIFIED SEVERAL PRPS. ON MAY 15, 1985 AND SEPTEMBER 30, 1985, EPA NOTIFIED THE THEN-IDENTIFIED PRPS OF THE CONDITIONS AT THE SITE AND THEIR POTENTIAL LIABILITY FOR THE COSTS OF REMEDIATING SUCH CONDITIONS. CERTAIN INFORMATION WAS ALSO REQUESTED OF THE PRPS. THE NOTIFIED PRPS WERE ALSO INVITED TO PARTICIPATE IN A REMOVAL OF HAZARDOUS SUBSTANCES FROM THE SITE. NO PRPS CAME FORWARD TO TAKE ACTION AT THE SITE.

ON APRIL 13, 1987 EPA SENT SPECIAL NOTICE LETTERS TO FOUR IDENTIFIED PRPS AND REQUESTED VOLUNTARY PERFORMANCE OF A RI/FS TO ABATE ANY RELEASE OR THREATENED RELEASE OF HAZARDOUS SUBSTANCES. NONE OF THE PRPS NOTIFIED AGREED TO PERFORM THE REQUESTED WORK. EPA THEREFORE PROCEEDED TO CONDUCT THE RI/FS UTILIZING THE SUPERFUND TRUST MONEY.

FOLLOWING EPA'S REMEDY SELECTION OF INCINERATION FOR OU TWO CONTAMINATED SOILS IN THE FAIRWAY SIX STOCKPILE IN JUNE 1989, EPA ISSUED SPECIAL NOTICE LETTERS TO TWENTY-TWO PRPS ON DECEMBER 21, 1989. THE SPECIAL NOTICE LETTER INVITED PRPS TO ENTER INTO NEGOTIATIONS FOR IMPLEMENTATION OF REMEDIAL ACTION AT OU TWO. DUE TO THE LACK OF PRP INTEREST TO VOLUNTARILY IMPLEMENT THE SELECTED REMEDY, EPA ISSUED UNILATERAL ADMINISTRATIVE ORDERS UNDER CERCLA S 106 TO FOUR PRPS DURING THE WEEK OF MARCH 5, 1990 DIRECTING THEM TO PERFORM THE SELECTED REMEDY FOR OU TWO. ONE PRP, UNION CARBIDE, AGREED TO IMPLEMENT THE SELECTED REMEDY AT OU TWO.

ON JUNE 28, 1991, EPA ISSUED A GENERAL NOTICE LETTER TO 19 PRPS. THE NOTICE LETTER PROVIDED AN OPPORTUNITY FOR THE PRPS TO MEET WITH EPA TO ALLOW EPA TO FACILITATE COOPERATION AND COORDINATION AMONG ALL PARTIES INVOLVED. FOLLOWING ISSUANCE OF THIS RECORD OF DECISION, SPECIAL NOTICE LETTERS, PURSUANT TO CERCLA SECTION 122(E), WILL BE ISSUED TO THE PRPS. THE SPECIAL NOTICE LETTERS WILL REQUEST VOLUNTARY PARTICIPATION BY THE PRPS IN IMPLEMENTATION OF THE SELECTED REMEDY FOR OU ONE.

THE DEPARTMENT OF JUSTICE (DOJ) FILED A LAWSUIT ON BEHALF OF EPA REGION IV AGAINST FIVE DEFENDANTS ON MARCH 31, 1989, PURSUANT TO CERCLA SECTION 107 FOR RECOVERY OF PAST AND FUTURE RESPONSE COSTS. THE SUIT IS DOCKETED AS CIVIL ACTION NO. C-89-231-R AND WAS FILED IN THE US DISTRICT COURT FOR MIDDLE DISTRICT OF NORTH CAROLINA, ROCKINGHAM DIVISION, GREENSBORO, NORTH CAROLINA. AS NEW INFORMATION BECAME AVAILABLE, THE UNITED STATES' COMPLAINT HAS TWICE BEEN AMENDED. INDIVIDUALS AND COMPANIES WHO ARE RESPONSIBLE FOR SITE CONTAMINATION ARE NOW NAMED AS DEFENDANTS IN THE PRESENT COST RECOVERY LITIGATION.

#HCP

## 3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

A COMMUNITY RELATIONS PLAN FOR THE ABERDEEN PESTICIDE DUMPS SITE WAS FINALIZED IN APRIL 1988. THIS DOCUMENT LISTS CONTACTS AND INTERESTED PARTIES THROUGHOUT GOVERNMENT AND THE LOCAL COMMUNITY. IT ALSO ESTABLISHES COMMUNICATION PATHWAYS TO ENSURE TIMELY DISSEMINATION OF PERTINENT INFORMATION. A FACT SHEET OUTLINING THE REMEDIAL INVESTIGATION SAMPLING PROGRAM WAS DISTRIBUTED IN JUNE 1988. SUBSEQUENTLY, AN AVAILABILITY SESSION WAS HELD ON JULY 18, 1988 AT THE ABERDEEN RAILROAD DEPOT TO ANSWER QUESTIONS CONCERNING THE UPCOMING RI/FS ACTIVITIES. THE RI/FS AND THE PROPOSED PLAN FOR OU ONE WERE RELEASED TO THE PUBLIC ON MAY 23, 1991.

SECTIONS 113(K)(1)(B)(I-V) AND 117 OF CERCLA, AS AMENDED BY SARA, REQUIRE EPA TO ESTABLISH ADMINISTRATIVE RECORDS CONTAINING DOCUMENTS USED TO SELECT RESPONSE ACTIONS UNDER CERCLA. ALL DOCUMENTS WERE MADE AVAILABLE IN BOTH THE ADMINISTRATIVE RECORD AND THE INFORMATION REPOSITORY MAINTAINED AT THE ABERDEEN TOWN HALL. A PUBLIC COMMENT PERIOD WAS HELD FROM MAY 23, 1991 TO JULY 24, 1991, AND UPON REQUEST WAS EXTENDED AN ADDITIONAL 15 DAYS TO AUGUST 8, 1991. A PUBLIC

MEETING WAS HELD ON MAY 30, 1991 TO PRESENT THE RESULTS OF THE RI/FS AND EPA'S PREFERRED ALTERNATIVE AS PRESENTED IN THE PROPOSED PLAN FOR THE SITE. A TRANSCRIPT OF THE MAY 30, 1991 PUBLIC MEETING IS AVAILABLE FOR REVIEW IN THE ADMINISTRATIVE RECORD. PRIOR TO THE MAY 30, 1991, MEETING A PUBLIC NOTICE WAS PROVIDED IN TWO LOCAL NEWSPAPERS. THE PUBLIC MEETING WAS ALSO ANNOUNCED IN THE PROPOSED PLAN FACT SHEET WHICH WAS DISTRIBUTED TO APPROXIMATELY 200 INTERESTED PARTIES. IN ADDITION TO THE MAY 30, 1991 PUBLIC MEETING, AN AVAILABILITY SESSION WAS HELD ON JULY 2, 1991 AT THE REQUEST OF LOCAL CITIZENS. THE AVAILABILITY SESSION WAS HELD TO GIVE THE PUBLIC AMPLE TIME TO REVIEW THE ADMINISTRATIVE RECORD AND BECOME INFORMED ABOUT THE BASIS FOR EPA'S PROPOSAL OF A PREFERRED ALTERNATIVE. EPA STAFF AT THE AVAILABILITY SESSION INCLUDED TECHNICAL EXPERTS, LEGAL COUNSEL, A REGIONAL TOXICOLOGIST, COMMUNITY RELATIONS SUPPORT AND THE REMEDIAL PROJECT MANAGER FOR THE SITE.

ALL COMMENTS WHICH WERE RECEIVED BY EPA PRIOR TO THE END OF THE PUBLIC COMMENT PERIOD, INCLUDING THOSE EXPRESSED VERBALLY AT THE PUBLIC MEETING, ARE ADDRESSED IN THE RESPONSIVENESS SUMMARY WHICH IS PART III OF THIS RECORD OF DECISION.

## **#SROU**

### **4.0 SCOPE AND ROLE OF OPERABLE UNITS WITHIN SITE STRATEGY**

AS WITH MANY SUPERFUND SITES, THE PROBLEMS AT THE ABERDEEN PESTICIDE DUMPS SITE ARE COMPLEX. AS A RESULT, EPA HAS ORGANIZED THE WORK INTO THREE MANAGEABLE COMPONENTS CALLED OPERABLE UNITS (OU).

OPERABLE UNIT ONE (OU ONE) ADDRESSES SURFACE AND SUBSURFACE SOIL CONTAMINATION AT THE FIVE AREAS COMPRISING THE SITE. IN THIS ROD FOR OU ONE, EPA IS SELECTING FINAL SOURCE CONTROL REMEDIAL ACTION PLAN. THIS OPERABLE UNIT WILL ADDRESS CONTAMINATED SURFACE AND SUBSURFACE SOIL AT ALL OF THE FIVE AREAS THAT COMPRISE THE ABERDEEN PESTICIDE DUMPS SITE. THIS OPERABLE UNIT POSES THE PRINCIPAL THREAT TO HUMAN HEALTH AND THE ENVIRONMENT BECAUSE OF THE RISKS FROM POSSIBLE INGESTION, INHALATION OR DERMAL CONTACT WITH CONTAMINATED SOILS. MOREOVER, CONTAMINATED SOIL REMAINS A CONTINUING SOURCE FOR CONTAMINANT MIGRATION FROM THE SOIL INTO THE UNDERLYING GROUNDWATER WHICH IS THE SOLE SOURCE OF DRINKING WATER FOR THE LOCAL RESIDENTS. THE PURPOSE OF THIS RESPONSE IS TO PREVENT CURRENT OR FUTURE EXPOSURE TO THE CONTAMINATED SOILS AND TO REDUCE CONTAMINANT MIGRATION INTO THE GROUNDWATER.

OPERABLE UNIT TWO (OU TWO) IS NOW RE-DESIGNATED AS OPERABLE UNIT FOUR. OPERABLE UNIT THREE (OU THREE) WAS DESIGNATED FOR ADDRESSING GROUNDWATER CONTAMINATION AT THE FIVE AREAS COMPRISING THE SITE. IN ADDITION, AN ECOLOGICAL ASSESSMENT CURRENTLY UNDER REVIEW AT ALL FIVE AREAS COMPRISING THE SITE WILL BE ADDRESSED.

OPERABLE UNIT FOUR (OU FOUR, FORMERLY OU TWO) WAS DESIGNATED FOR REMEDIATION OF CONTAMINATED SOIL EXCAVATED IN 1988 AND NOW STORED IN THE FAIRWAY SIX STOCKPILE. A RECORD OF DECISION SIGNED ON JUNE 30, 1989 SELECTED ON-SITE INCINERATION OF PESTICIDE LADEN SOIL AND DEBRIS AND ON-SITE DISPOSAL OF THE TREATED RESIDUALS. AFTER RECEIPT OF A UNILATERAL ADMINISTRATIVE ORDER, UNION CARBIDE AGREED IN MARCH 1990 TO IMPLEMENT THE SELECTED REMEDY. HOWEVER, UPON REQUEST BY UNION CARBIDE, EPA HAS ALLOWED A POSTPONEMENT OF IMPLEMENTATION OF THE SELECTED REMEDY FOR OU FOUR PENDING THE ISSUANCE OF THIS RECORD OF DECISION FOR OU ONE.

BECAUSE THE OPERABLE UNITS ARE RELATED ON THE BASIS OF GEOGRAPHY, CONTAIN SIMILAR OR IDENTICAL WASTES AND ARE RELATED BASED ON THE THREAT POSED, OPERABLE UNITS ONE AND FOUR WILL BE COMBINED FOR PURPOSES OF IMPLEMENTING THIS RECORD OF DECISION'S SELECTED REMEDY. FURTHER DISCUSSION FOR THE BASIS OF THIS REVISION IS PROVIDED IN SECTION 10.0 AMENDMENT TO FORMER OPERABLE UNIT TWO RECORD OF DECISION.

## **#SSC**

### **5.0 SUMMARY OF SITE CHARACTERISTICS**

THE FOLLOWING DISCUSSION IS BASED ON ANALYTICAL RESULTS OBTAINED DURING THE FIELD INVESTIGATION CONDUCTED FROM MARCH 1989 THROUGH MARCH 1990. SUBSEQUENT INVESTIGATIONS CONDUCTED BY EPA AT THE FARM CHEMICALS AND FAIRWAY SIX AREAS IN JULY AND NOVEMBER 1990 ARE ALSO DISCUSSED.

BECAUSE THIS ROD ADDRESSES SOIL REMEDIATION ONLY, RESULTS OF THE SEDIMENT, GROUNDWATER AND ECOLOGICAL INVESTIGATION WILL BE DEFERRED TO A SUBSEQUENT ROD. HOWEVER, NOTE THAT THE TOTAL CARCINOGENIC AND NONCARCINOGENIC RISKS DISCUSSED IN SECTION 6.0 INCLUDES RISKS TO HUMAN HEALTH AND THE ENVIRONMENT FROM ALL POTENTIAL ROUTES OF EXPOSURE.

## 5.1 FARM CHEMICALS AREA

### 5.1.1 SURFACE SOILS (FARM CHEMICALS AREA)

THE FARM CHEMICALS AREA PREVIOUSLY OPERATED AS A PESTICIDE FORMULATION FACILITY. A TOTAL OF 49 SAMPLES WERE COLLECTED DURING THE FIELD INVESTIGATION FOR PESTICIDE ANALYSIS. TWO BACKGROUND STATIONS WERE SELECTED IN THE AREA SURROUNDING THE FARM CHEMICALS AREA. A TOTAL OF 24 STATIONS WERE SAMPLED AT TWO DEPTHS (3-4 AND 5-6 FEET) WITH THE EXCEPTION OF STATIONS SSS-115 (3-4 FEET), SSS-122 (5-6 FEET) AND SSS-119 AND SSS-123 (SURFICIAL SAMPLE). SEVEN OF THESE SAMPLES WERE ALSO ANALYZED FOR TCL METALS, TOTAL ORGANIC CONTENT, CATION EXCHANGE CAPACITY, AND PERCENT MOISTURE. TABLE 1 PRESENTS THE NUMBER OF SAMPLES COLLECTED IN SOIL, TANKS, DRUMS, INSULATION AND AIR, IN ADDITION TO THE TYPE OF ANALYSIS PERFORMED ON THESE SAMPLES. THE SIGNIFICANT CONTAMINANTS AND THEIR MAXIMUM CONCENTRATIONS FOR ALL MEDIA AT THE FARM CHEMICALS AREA ARE PRESENTED IN TABLE 2.

ACROSS THE SITE, FOURTEEN DIFFERENT PESTICIDE SPECIES WERE DETECTED IN THE SOIL SAMPLES TAKEN DURING THE RI/FS. SPECIES, FREQUENCY OF DETECTION (NUMBER OF POSITIVE VALUES OVER TOTAL NUMBER OF SAMPLES NOT INCLUDING SPLIT SAMPLES), AND THE CONCENTRATION RANGE ARE SUMMARIZED, IN DECREASING ORDER OF DETECTION.

PESTICIDE SPECIES	FREQUENCY OF DETECTION		CONCENTRATION RANGE (UG/KG)
4,4'-DDT	41/47	(87 PERCENT)	84 - 13,000,000
TOXAPHENE	29/47	(70 PERCENT)	450 - 3,200,000
ALPHA-BHC	26/47	(55 PERCENT)	8.4 - 8,800,888
GAMMA-BHC	19/47	(40 PERCENT)	9 - 1,300,000
BETA-BHC	15/47	(32 PERCENT)	11 - 420,000
4,4'-DDD	13/47	(28 PERCENT)	34 - 230,000
4,4'-DDE	13/47	(28 PERCENT)	22 - 230,000
DELTA-BHC	12/47	(26 PERCENT)	9.5 - 540,000
DIELDRIN	9/47	(19 PERCENT)	39 - 3,600
ALDRIN	5/47	(11 PERCENT)	82 - 590
GAMMA-CHLORDANE	4/47	(9 PERCENT)	89 - 640
HEPTACHLOR	4/47	(9 PERCENT)	12 - 660
ENDRIN KETONE	2/47	(4 PERCENT)	18 - 97
METHYLOXYCHLOR	1/47	(2 PERCENT)	84

IN GENERAL, MOST OF THE AREAS OF ELEVATED PESTICIDE CONCENTRATIONS ARE LOCATED EITHER NEAR THE EDGES OF BUILDINGS AND/OR LOADING DOCK AREAS, OR IN SUSPECTED (OR KNOWN) BURIED TRENCH AREAS IDENTIFIED IN THE GEOPHYSICAL SURVEY. NO PCBS WERE DETECTED. TOTAL PESTICIDE CONCENTRATIONS IN SURFACE SOIL SAMPLES IS SHOWN IN FIGURE 7.

NO BACKGROUND SAMPLE FOR METALS WAS COLLECTED. HOWEVER, THE METALS ANALYSES FROM THE SHALLOW SUBSURFACE SOIL SAMPLE FROM THE BACKGROUND MONITORING WELL FOR THIS AREA WAS USED FOR COMPARISON. EXCEPT FOR STATION SSS-119, SURFICIAL SOILS SAMPLES REVEALED METALS AND CONCENTRATIONS TYPICAL OF THE AREA AND MAINLY COMPARABLE TO BACKGROUND, EXCEPT FOR ELEVATED LEAD LEVELS AT THE SHALLOW INTERVAL AT TWO STATIONS DETECTING 21 AND 26 MG/KG. FOREIGN MATERIAL WAS ENCOUNTERED DURING AUGERING AT BOTH THESE STATIONS, AND MAY BE RELATED TO THESE ELEVATED CONCENTRATIONS OF LEAD. STATION SSS-119 WAS COLLECTED FROM AN AREA OF STAINED SOIL AND PESTICIDE-LIKE MATERIAL. ARSENIC WAS FOUND AT AN EXTREMELY ELEVATED CONCENTRATION, 5,000 PPM. LEAD WAS ALSO FOUND HERE AT 20,000 PPM, MUCH GREATER THAN THAT FOUND ELSEWHERE ON-SITE.

FOR THE PURPOSE OF A BASELINE RISK ASSESSMENT, ALL COMPOUNDS PRESENT AT A MAXIMUM CONCENTRATION GREATER THAN 5 TIMES THE LABORATORY BLANK CONCENTRATION WERE EVALUATED. EXCEPTIONS TO THIS INCLUDE ACETONE, METHYLENE CHLORIDE, TOLUENE, 2-BUTANONE, AND PHTHALATES WHICH WERE EVALUATED IF

PRESENT AT CONCENTRATIONS GREATER THAN 10 TIMES THE CORRESPONDING LABORATORY BLANK CONCENTRATIONS. THE ORGANIC CONTAMINANTS OF CONCERN FOR THE SURFICIAL SOIL MEDIA AT THE FARM CHEMICALS AREA INCLUDE: ALPHA-BHC, BETA-BHC, DELTA-BHC, GAMMA-BHC, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, ALDRIN, DIELDRIN, DELTA-CHLORDANE, HEPTACHLOR, ENDRIN KETONE, AND TOXAPHENE. METALS OF CONCERN FOR THIS AREA INCLUDE: ARSENIC, LEAD, BARIUM, COPPER, MANGANESE, NICKEL, AND ZINC.

TWO ADDITIONAL FIELD INVESTIGATIONS WERE CONDUCTED AT THE FARM CHEMICALS AREA DURING THE WEEKS OF JULY 23 AND NOVEMBER 12, 1990. THE PURPOSE OF THESE FIELD INVESTIGATIONS WAS TO DETERMINE IF ANY ADDITIONAL PESTICIDES, OTHER THAN THOSE FOUND DURING THE RI FIELD SAMPLING, HAD CONTAMINATED THE SOIL AND GROUNDWATER. REPORTS PREPARED BY EPA ENVIRONMENTAL SERVICES DIVISION ARE DATED SEPTEMBER 29, 1990 AND FEBRUARY 14, 1991 ARE MAINTAINED IN THE ADMINISTRATIVE RECORD. ONLY RESULTS OF THE SOIL INVESTIGATION ARE DISCUSSED BELOW.

SIXTEEN SURFACE SOIL SAMPLES (FROM 0 - 3.5 FEET) WERE COLLECTED FROM THE FARM CHEMICALS AREA. THESE SAMPLES WERE ANALYZED FOR THE FOLLOWING SPECIFIC PESTICIDES AND VOCs:

PESTICIDE	VOC
SEVIN	CARBON DISULFIDE
PHORATE	CARBON TETRACHLORIDE
MALATHION	1,2-DICHLOROETHANE
DISYSTON	1,2-DIBROMOETHANE
AZODRIN	CIS-1,3-DICHLOROPROPENE
DBCP	TRANS-1,3-DICHLOROPROPENE
2,4-D	
TOXAPHENE	
GUTHION	

ADDITIONALLY, ANALYSIS OF FULL-SCAN PESTICIDES, PCBS AND PURGEABLE ORGANIC COMPOUNDS WAS CONDUCTED ON ONE SOIL SAMPLE. FIGURE 7A ILLUSTRATES THE SAMPLE LOCATIONS. THE CONTAMINANTS DETECTED AND THEIR CONCENTRATIONS ARE PRESENTED BELOW:

CONTAMINANT	CONCENTRATION RANGE (UG/KG)
TOXAPHENE	4,000 - 48,000,000
SEVIN (CARBARYL)	100 - 360,000
DBCP*	2.6 - 69
CARBON DISULFIDE	4.4 - 34
2,4-D	12,000
MALATHION	370 - 750
4,4'-DDT	150
CHLORDANE (TOTAL)	9.7
DIELDRIN	32

\* DBCP = 1,2-DIBROMO-3-CHLOROPROPANE

A SUPPLEMENT RISK ASSESSMENT WAS CONDUCTED ON THE CONTAMINANTS IDENTIFIED DURING THE JULY AND NOVEMBER 1990 INVESTIGATION AND ARE DISCUSSED IN SECTION 6.0 OF THIS DOCUMENT.

#### 5.1.2 SUBSURFACE SOILS (FARM CHEMICALS AREA)

NINETEEN SUBSURFACE SOIL SAMPLES WERE COLLECTED FROM THE MONITORING WELLS INSTALLED DURING THE FIELD INVESTIGATION PORTION OF THE RI/FS. SAMPLES WERE COLLECTED AT THREE INTERVALS: ONE TAKEN ABOVE THE WATER TABLE, ONE FROM THE CAPILLARY FRINGE ZONE, AND ONE FROM THE INTERVAL WHERE THE WELL SCREEN WAS INSTALLED. SAMPLES COLLECTED FROM BORING 1-MW-01 WERE USED TO EVALUATE BACKGROUND CONDITIONS. THE SIGNIFICANT SUBSURFACE SOIL CONTAMINANTS AND THEIR MAXIMUM CONCENTRATIONS ARE PRESENTED IN TABLE 2.

ELEVATED LEVELS OF 4,4'-DDT, -DDD, -DDE (120-1,300 PPB) AND TOXAPHENE (4,500 PPB) WERE FOUND IN SUBSURFACE SOIL SAMPLES COLLECTED AT 20 FEET BELOW GROUND SURFACE. BHC ISOMERS AND 4,4'-DDT WERE IDENTIFIED AT A DEPTH OF 35 FEET BELOW GROUND SURFACE AT CONCENTRATIONS OF 52-160 PPB AND

66 PPB RESPECTIVELY. THE PESTICIDE CONTAMINATION DETECTED IN THE SUBSURFACE SOIL SAMPLES DEMONSTRATES DOWNWARD MIGRATION OF THESE CONTAMINANTS.

ETHYL BENZENE AND TOTAL XYLENES, WHICH WERE DETECTED IN AT LEAST ONE SAMPLE FROM FOUR OF THE FIVE ON-SITE BORINGS, WERE THE ONLY VOCs FOUND IN SIGNIFICANT CONCENTRATIONS. AS WITH THE PESTICIDE CONCENTRATIONS, SAMPLES FROM THE BORING FOR 1-MW-04 WERE THE MOST CONTAMINATED WITH VOCs. THE SHALLOW SAMPLE CONTAINED ETHYL BENZENE AND TOTAL XYLENES AT CONCENTRATIONS OF 1,400 AND 10,000 UG/KG, RESPECTIVELY; WHILE THE WATER TABLE SAMPLE WAS MOST CONTAMINATED WITH 52,000 AND 200,000 UG/KG OF THESE CONTAMINANTS DETECTED. FURTHER DOWNWARD MIGRATION OF THESE VOCs WAS EVIDENT, AS TRACE LEVELS WERE DETECTED IN THE DEEPEST SAMPLE (11 AND 50 UG/KG, RESPECTIVELY). TOTAL PESTICIDE CONCENTRATION FOR THE SUBSURFACE SOIL SAMPLES ARE SHOWN IN FIGURE 7.

METALS DETECTED IN SAMPLES FROM THE BORINGS ON-SITE WERE MAINLY TYPICAL OF THOSE FOUND IN THE AREA, AND CONCENTRATIONS OF MOST OF THEM WERE COMPARABLE TO BACKGROUND LEVELS. HOWEVER, ELEVATED CONCENTRATIONS OF SEVERAL METALS WERE DETECTED IN THE DEEPEST SAMPLE FROM 1-MW-06 AT A DEPTH OF 55 FEET. METALS PRESENT IN CONCENTRATIONS GREATER THAN 2 TIMES THE CONTRACT REQUIRED DETECTION LIMIT (CRDL) INCLUDED: ALUMINUM, CALCIUM, CHROMIUM, IRON, LEAD, VANADIUM, AND ZINC. TOTAL ORGANIC CARBON, CATION EXCHANGE CAPACITY, AND PERCENT MOISTURE ANALYSIS FOR THESE SAMPLES RANGED FROM 110-15,000, 1.9-4 MG/KG, AND 3-21 PERCENT, RESPECTIVELY.

ORGANIC SUBSURFACE SOIL CONTAMINANTS MEETING THE MINIMUM CONCENTRATION REQUIREMENTS FOR EVALUATION UNDER THE BASELINE RISK ASSESSMENT ARE AS FOLLOWS: 4,4-DDD, 4,4-DDE, 4,4-DDT, ALPHA-BHC, BETA-BHC, DELTA-BHC, GAMMA-BHC, AND TOXAPHENE. METAL CONTAMINANTS EVALUATED FOR THIS AREA INCLUDE: CHROMIUM, BARIUM, COBALT, COPPER, MANGANESE, VANADIUM, AND ZINC.

#### 5.1.3 TANK/DRUM/INSULATION (FARM CHEMICALS AREA)

THE FARM CHEMICALS AREA IS THE ONLY AREA OF THE SITE CONTAINING BUILDINGS/STRUCTURES. THERE ARE CURRENTLY 11 BUILDINGS AND 3 ABOVE GROUND STORAGE TANKS AT THIS AREA. SOIL SAMPLES COLLECTED NEAR THE FOUNDATIONS OF SEVERAL OF THE BUILDINGS CONTAINED HIGHLY ELEVATED LEVELS OF PESTICIDES. ELEVEN INSULATION SAMPLES WERE COLLECTED FROM THESE BUILDINGS, CONSISTING OF BOTH BLOWN-ON INSULATION AND PIPE-WRAP TYPES FOR ASBESTOS ANALYSIS. THREE SAMPLES TAKEN FROM PIPE-WRAP INSULATION NEAR THE WAREHOUSE JUST SOUTH OF THE MIXING VAT AREA WERE POSITIVE FOR ASBESTOS (20-40 PERCENT). THREE OF NINE BUILDING SAMPLES REVEALED LEVELS OF ASBESTOS UP TO 40 PERCENT. RESIDUAL MATERIALS IN DRUMS AND CONTAINERS IN SEVERAL OF THE ON-SITE BUILDINGS WERE SAMPLED AND ANALYZED FOR PESTICIDES, PCBS, VOCs, AND TCL METALS. ON-SITE DRUMS, 5-GALLON BUCKETS AND TANKS WERE SAMPLED. PCBS WERE NOT DETECTED IN ANY SAMPLES. ONE LIQUID SAMPLE COLLECTED FROM A TANK CONTAINED 490,000 PPM TOXAPHENE. SWAB SAMPLES FROM A MIXING VAT AND SUMP AREA REVEALED PESTICIDE RESIDUES. MOST TANK SAMPLES REVEALED ELEVATED LEVELS OF VOCs. SVOCs WERE ALSO DETECTED IN THE LIQUID TANK SAMPLE. METALS WERE DETECTED IN THE LIQUID TANK AND SWAB SAMPLES.

#### 5.1.4 AIR (FARM CHEMICALS AREA)

ONE AIR SAMPLE COLLECTED AT THE FARM CHEMICALS AREA WAS ANALYZED FOR PESTICIDES, PCBS, AND ASBESTOS. LABORATORY RESULTS REVEALED TEN PESTICIDE SPECIES RANGING FROM 0.013-2.8 UG/M3. THESE PESTICIDES INCLUDED ALPHA-BHC, GAMMA-BHC, HEPTACHLOR, ALDRIN, DIELDRIN, GAMMA-CHLORDANE, TOXAPHENE, 4,4'-DDD, 4,4'-DDE, AND 4,4'-DDT. ASBESTOS AND PCBS WERE NOT DETECTED IN THE ON-SITE AIR SAMPLE.

#### 5.1.5 AREA OF CONTAMINATION (FARM CHEMICALS AREA)

TWO KNOWN BURIED TRENCHES AND ONE SUSPECTED TRENCH ARE LOCATED AT THE SOUTHEASTERN PORTION OF THE SITE AREA AND MAY EXTEND BEYOND THE PRESENT FENCE KNOWN AS FARM CHEMICALS PROPERTY. ONE OF THE KNOWN TRENCHES IS LOCATED IN THE SOUTHERN PORTION OF THE AREA AND PROBABLY CONSISTS OF A SYSTEM OF MULTIPLE TRENCHES BASED ON GEOPHYSICAL SURVEY RESULTS. THE OUTLINE OF THESE TRENCHES IS FAIRLY WELL DEFINED; HOWEVER, THEIR DEPTHS ARE UNKNOWN. FOR VOLUME ESTIMATION PURPOSES IT IS ASSUMED THAT ALMOST THE ENTIRE SOUTHERN PORTION OF THE AREA WILL HAVE TO BE EXCAVATED/TREATED. THE OTHER KNOWN TRENCH IS LOCATED IN CENTER OF THE AREA AND WAS CONFIRMED BY SURFICIAL AND SUBSURFACE SOIL SAMPLING. HOWEVER, THE BOUNDARIES OF THIS TRENCH ARE NOT CLEARLY ESTABLISHED.

ONE SAMPLE COLLECTED IN THE SUSPECTED TRENCH AREA IN THE EASTERN PORTION OF THE FARM CHEMICALS AREA CONTAINS A TOTAL PESTICIDE CONCENTRATION IN EXCESS OF 3,000 UG/KG AT A DEPTH OF 5 TO 6 FEET. FURTHER SAMPLING SHOULD BE CONDUCTED IN THIS AREA TO VERIFY THE PRESENCE OF A TRENCH; HOWEVER, THIS RELATIVELY SMALL AREA IS ASSUMED TO REQUIRE REMEDIATION.

AS MENTIONED ABOVE, FOR VOLUME ESTIMATES THESE TRENCHES (AND UNDERLYING CONTAMINATED SOILS) ARE ASSUMED TO EXTEND TO A DEPTH OF 15 FEET BELOW GRADE. TO REACH THE TARGET CLEANUP GOALS AT A (10-6) HEALTH BASED LEVEL, THE TOTAL VOLUME OF MATERIAL TO BE REMEDIATED FROM THE FARM CHEMICALS AREA IS ESTIMATED TO BE 1,307,962 CUBIC FEET OR 48,443 CUBIC YARDS. AREAS REQUIRING EXCAVATION ARE PRESENTED IN FIGURE 8.

## 5.2 TWIN SITES AREA

### 5.2.1 SURFACE SOILS (TWIN SITES AREA)

THE TWIN SITES AREA CONSISTS OF THREE DISPOSAL AREAS (AREAS "A", "B", AND "C") LOCATED ON ADJACENT PROPERTIES. A TOTAL OF 32 SAMPLING STATIONS WERE SELECTED FOR THE TWIN SITES AREA. THREE BACKGROUND SAMPLES WERE COLLECTED SURROUNDING THE PERIPHERY OF THE ON-SITE SAMPLING GRID AND ANALYZED FOR PESTICIDES AND PCBS. ALTHOUGH NO BACKGROUND SURFACE SOIL SAMPLES WERE ANALYZED FOR METALS, BACKGROUND COMPARISON LEVELS WERE OBTAINED FROM SUBSURFACE SOIL SAMPLE SUB-201 COLLECTED AT 15 FEET BELOW GRADE. THE REMAINING 55 SAMPLES WERE COLLECTED FROM 29 STATIONS LOCATED WITHIN THE GRID AREA AND ANALYZED FOR PESTICIDES AND PCBS. THESE SAMPLES RANGED IN DEPTH FROM 0 - 5 FEET BELOW GRADE. SIX OF THE ON-SITE SAMPLES WERE ALSO ANALYZED FOR TCL METALS, TOTAL ORGANIC CONTENT, CATION EXCHANGE CAPABILITY, AND PERCENT MOISTURE. TABLE 3 LISTS THE SAMPLES COLLECTED IN SOIL AND AIR IN ADDITION TO THE TYPE OF ANALYSIS PERFORMED ON THESE SAMPLES. THE SIGNIFICANT CONTAMINANTS AND THEIR MAXIMUM CONCENTRATIONS FOR ALL MEDIA AT THE TWIN SITES AREA ARE PRESENTED IN TABLE 4.

FIFTY PERCENT OF THE ON-SITE STATIONS REVEALED PESTICIDE CONTAMINATION AT CONCENTRATIONS GREATER THAN 2 TIMES THE CRDL. THE PESTICIDES DETECTED, THEIR FREQUENCY OF DETECTION, AND CONCENTRATION RANGES ARE SUMMARIZED BELOW.

PESTICIDE SPECIES	FREQUENCY OF DETECTION	CONCENTRATION RANGE (UG/KG)
4,4'-DDT	21/55	ND - 340,000
ALPHA-BHC	19/55	ND - 440,000
BETA-BHC	18/55	ND - 35,000
DELTA-BHC	14/55	ND - 160,000
GAMMA-BHC	13/55	ND - 160,000
4,4'-DDD	13/55	ND - 11,000
TOXAPHENE	4/55	ND - 340,000
DIELDRIN	4/55	ND - 1,100
ALDRIN	3/55	ND - 390
ENDOSULFAN I	2/55	ND - 160
4,4'-DDE	2/55	ND - 37,000
HEPTACHLOR	1/55	ND - 42

THE SAMPLING STATIONS WERE LOCATED EITHER IN OR ADJACENT TO SUSPECTED BURIAL AREAS AS IDENTIFIED DURING THE GEOPHYSICAL SURVEY. THE BHC ISOMERS IN ADDITION TO 4,4'-DDT, AND 4,4'-DDD, ACCOUNT FOR MOST OF THE CONTAMINATION FOR THE TWIN SITES AREA. STATION SSS-218, LOCATED SOUTH OF AREA C, WAS THE MOST CONTAMINATED WITH TOTAL PESTICIDE CONCENTRATIONS OF 1,162,800 UG/KG AT A DEPTH OF 3 FEET BELOW GRADE. SAMPLE SSS-227, LOCATED IN AREA A, WAS THE SECOND MOST CONTAMINATED WITH A TOTAL PESTICIDE CONCENTRATION OF 1,146,000 UG/KG AT A DEPTH OF 3 FEET BELOW GRADE. PESTICIDE CONTAMINATION IN SURFACE SOIL SAMPLES SSS-230 AND SSS-224 SUGGESTS THE EXISTENCE OF ADDITIONAL BURIED MATERIAL SOUTHEAST OF AREA A. PCBS WERE NOT DETECTED IN ANY OF THE SURFACE SOIL SAMPLES. TOTAL PESTICIDE CONCENTRATIONS FOR THE SURFACE SOILS ARE SHOWN IN FIGURE 9.

SEVERAL METALS WERE DETECTED IN THE SIX ON-SITE SAMPLES ANALYZED FOR METALS AT CONCENTRATIONS GREATER THAN 2 TIMES THE CRDL. THE CONTAMINANTS DETECTED IN THESE SAMPLES INCLUDED ALUMINUM,



CALCIUM, CHROMIUM, COPPER, LEAD, IRON, AND VANADIUM IN MAXIMUM CONCENTRATIONS (MG/KG) OF 12,000, 220,000, 15, 36, 4.7, 7,800, AND 24, RESPECTIVELY. OTHER ANALYSIS FOR THESE SAMPLES INCLUDED TOTAL ORGANIC CONTENT (ND TO 5,900 MG/KG), CATION EXCHANGE CAPACITY (1.8 TO 16 MG/KG), AND PERCENT MOISTURE (4 TO 34 PERCENT).

BASED ON THE QUALIFICATIONS REQUIRED FOR THE BASELINE RISK ASSESSMENT, THE FOLLOWING ORGANIC COMPOUNDS WERE EVALUATED AS CONTAMINANTS OF CONCERN FOR THE SURFICIAL SOIL MEDIA AT THE TWIN SITES AREA: ALPHA-BHC, BETA-BHC, GAMMA-BHC, DELTA-BHC, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, ALDRIN, DIELDRIN, HEPTACHLOR, TOXAPHENE, ENDRIN KETONE, AND ENDOSULFAN I. THE METAL CONTAMINANTS OF CONCERN INCLUDE CHROMIUM, BARIUM, COPPER, MANGANESE, MERCURY, VANADIUM AND ZINC.

#### 5.2.2 SUBSURFACE SOILS (TWIN SITES AREA)

A TOTAL OF 15 SUBSURFACE SOIL SAMPLES WERE COLLECTED FROM THE 5 BORINGS LABELED 2-MW-01 THROUGH 2-MW-05. THESE SAMPLES WERE ANALYZED FOR PESTICIDES, PCBS, VOCs, TCL METALS, AND PERCENT MOISTURE. EIGHT OF THESE SAMPLES WERE ALSO ANALYZED FOR TOTAL ORGANIC CARBON AND THREE WERE ANALYZED FOR CATION EXCHANGE CAPACITY. STATION SUB-201, LOCATED IN THE SOUTHWEST CORNER OF THIS AREA, WAS USED TO EVALUATE BACKGROUND CONDITIONS. THE SIGNIFICANT SUBSURFACE SOIL CONTAMINANTS AND THEIR MAXIMUM CONCENTRATIONS ARE PRESENTED IN TABLE 4.

PESTICIDE CONTAMINATION WAS DETECTED ONLY IN SAMPLES COLLECTED FROM STATIONS SUB-203 AND SUB-204. SAMPLE SUB-203, DIRECTLY DOWNGRAIDENT FROM AREA "A", CONTAINED THE GREATEST LEVEL OF TOTAL PESTICIDE CONCENTRATIONS AT 6,730 UG/KG FROM A DEPTH OF 3 FEET. 4,4'-DDT COMPRISED OVER 50 PERCENT OF THE TOTAL PESTICIDE CONTAMINATION DETECTED IN THIS SAMPLE. XYLENE WAS THE ONLY VOC DETECTED IN THE SUBSURFACE SOIL SAMPLES AT CONCENTRATIONS GREATER THAN 2 TIMES THE CRDL. CONCENTRATIONS FOR THIS CONTAMINANT RANGED FROM 11 - 19 UG/KG AND WERE DETECTED IN THE SHALLOW AND DEEP INTERVAL AT SUB-202 AND IN ALL THREE INTERVALS IN SUB-204. PCBS WERE NOT DETECTED IN ANY OF THE SUBSURFACE SOIL SAMPLES. THE TOTAL PESTICIDE CONCENTRATIONS FOR SUBSURFACE SOILS ARE SHOWN IN FIGURE 9.

SEVERAL METALS WERE PRESENT IN THE SUBSURFACE SOIL SAMPLES IN CONCENTRATIONS IN EXCESS OF 2 TIMES THE CRDL. THESE CONTAMINANTS INCLUDED ALUMINUM, ARSENIC, CADMIUM, CHROMIUM, LEAD, AND MANGANESE. WITH THE EXCEPTION OF ALUMINUM, ALL OF THE METALS DETECTED WERE LOCATED IN THE EASTERN PORTION OF THE TWIN SITES AREA AT STATIONS SUB-202 AND SUB-204. THE PERCENT MOISTURE FOR THESE SAMPLES RANGED FROM 9 TO 20 PERCENT. THE TOTAL ORGANIC CARBON (TOC) FOR THE SEVEN ON-SITE SAMPLES ANALYZED FOR TOC RANGED FROM 170 TO 1,000 MG/KG. CATION EXCHANGE CAPACITY WAS ANALYZED FOR IN THREE SAMPLES, WITH VALUES RANGING FROM 2.7 TO 3.9 MG/KG.

ORGANIC SUBSURFACE SOIL CONTAMINANTS MEETING THE MINIMUM CONCENTRATION REQUIREMENTS FOR EVALUATION UNDER THE BASELINE RISK ASSESSMENT ARE AS FOLLOWS: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, ALPHA-BHC, BETA-BHC, DELTA-BHC, GAMMA-BHC, DIELDRIN, ENDRIN KETONE, 1,2-DICHLOROETHANE, ETHYL BENZENE, AND XYLENE. METAL CONTAMINANTS EVALUATED FOR THIS AREA INCLUDE ARSENIC, CADMIUM, BARIUM, VANADIUM, MANGANESE AND LEAD.

#### 5.2.3 AIR (TWIN SITES AREA)

ONE AIR SAMPLE WAS COLLECTED FROM THE TWIN SITES AREA AND ANALYZED FOR PESTICIDES AND PCBS. LABORATORY RESULTS INDICATE THAT THIS SAMPLE CONTAINED ALPHA-BHC, BETA-BHC, DELTA-BHC, GAMMA-BHC, HEPTACHLOR, 4,4'-DDD, 4,4'-DDE AND 4,4'-DDT. CONCENTRATIONS FOR THESE PESTICIDES RANGED FROM 0.011 TO 0.44 UG/M3. PCBS WERE NOT DETECTED IN THIS SAMPLE.

#### 5.2.4 AREA OF CONTAMINATION (TWIN SITES AREA)

AREA C IS A KNOWN PESTICIDE DISPOSAL AREA WHERE, UNLIKE AREAS A AND B, NO REMOVAL ACTION HAS BEEN TAKEN. THE EXACT BOUNDARIES OF TWIN SITES AREA C ARE UNKNOWN, HOWEVER, FOR VOLUMETRIC ESTIMATION THE VISIBLY CONTAMINATED AREA AT THE GROUND SURFACE IS ASSUMED TO EXTEND TO A DEPTH OF 15 FEET. BECAUSE AREA A HAS UNDERGONE A PRIOR REMOVAL ACTION, ONLY 10 FEET OF MATERIAL WAS ESTIMATED FOR REMEDIATION. BOTH THE AERIAL AND VERTICAL EXTENT OF THE CONTAMINATION IS NOT WELL DEFINED DUE TO THE LIMITED SAMPLING CONDUCTED IN THESE AREAS.

RESIDUAL LEVELS FOR TOTAL PESTICIDE CONTAMINATION EXCEEDED 1,162,800 UG/KG FOR SURFACE SOIL SAMPLES. THE AREAS OUTLINED FOR EXCAVATION WERE DELINEATED USING THE SURFACE SOIL SAMPLING RESULTS. TO OBTAIN THE TARGET (10-6) HEALTH-BASED CLEANUP LEVEL FOR THIS AREA, THE ESTIMATED VOLUME OF MATERIAL REQUIRING REMEDIATION IS 718,632 CUBIC FEET OR 26,616 CUBIC YARDS. AREAS REQUIRING EXCAVATION ARE PRESENTED IN FIGURE 10.

### 5.3 FAIRWAY SIX AREA

#### 5.3.1 SURFACE SOILS (FAIRWAY SIX AREA)

THE FAIRWAY SIX AREA CONSISTS OF A PESTICIDE DISPOSAL LOCATION ON THE NORTH AND SOUTH SIDE OF FAIRWAY NUMBER SIX OF "THE PIT" GOLF LINKS. A TOTAL OF 37 SAMPLING STATIONS WERE SELECTED FOR THIS AREA INCLUDING 4 BACKGROUND STATIONS LOCATED AROUND THE PURIFIER OF THE GRID AREA. TWO SAMPLES WERE COLLECTED AT BACKGROUND STATION SSS-314 AT DEPTHS OF 2-3 FEET AND 5-6 FEET, WHILE A SINGLE SAMPLE WAS COLLECTED AT 5-6 FEET FOR THE REMAINING BACKGROUND STATIONS. TWO SAMPLES WERE COLLECTED FROM EACH STATION WITHIN THE ON-SITE GRID AREA AT DEPTHS RANGING FROM 2-7 FEET, EXCEPT FOR SSS-339, WHERE ONLY A SINGLE SAMPLE WAS COLLECTED. ALL OF THE SAMPLES COLLECTED WERE ANALYZED FOR PESTICIDES ONLY. SIX OF THESE SAMPLES WERE ALSO ANALYZED FOR TCL METALS, TOTAL ORGANIC CARBON, CATION EXCHANGE CAPACITY, AND PERCENT MOISTURE. TABLE 5 LISTS THE SAMPLES COLLECTED IN SOIL AND AIR IN ADDITION TO THE TYPE OF ANALYSIS PERFORMED ON THESE SAMPLES. SIGNIFICANT CONTAMINANTS AND THEIR MAXIMUM CONCENTRATIONS FOR ALL MEDIA AT THE FAIRWAY SIX AREA ARE PRESENTED IN TABLE 6.

OF THE 33 SOIL SAMPLING STATIONS AT THE FAIRWAY SIX AREA, 23 CONTAINED DETECTABLE LEVELS OF PESTICIDES. PESTICIDES WERE FOUND AT BOTH DEPTHS SAMPLED AT 20 OF THE 33 STATIONS. SEVEN OF THE 10 STATIONS WHICH CONTAINED NO PESTICIDE CONTAMINATION WERE CONCENTRATED IN THE NORTH AND NORTHEASTERN 200 FEET OF THE GRID AREA. THE REMAINING 3 STATIONS WERE CONCENTRATED IN THE SOUTHEASTERN SECTION OF THE GRID AREA. THIRTEEN PESTICIDES WERE IDENTIFIED WITHIN THE SAMPLING GRID. THE TYPES, FREQUENCY OF DETECTION, AND CONCENTRATION RANGE ARE SUMMARIZED BELOW.

PESTICIDE SPECIES	FREQUENCY OF DETECTION	CONCENTRATION RANGE (UG/KG)
4,4-DDT	43/69 (62 PERCENT)	18* - 210,000
ALPHA-BHC	28/69 (41 PERCENT)	9.4* - 10,000
BETA-BHC	26/69 (38 PERCENT)	8.4* - 4,800
4,4-DDD	22/69 (32 PERCENT)	20* - 2,300
DELTA-BHC	23/69 (33 PERCENT)	8.3* - 1,800
GAMMA-BHC	13/69 (19 PERCENT)	8.5* - 1,600
DIELDRIN	6/69 (9 PERCENT)	17* - 360
4,4-DDE	6/69 (9 PERCENT)	18* - 1,800
TOXAPHENE	5/69 (7 PERCENT)	270* - 12,000
HEPTACHLOR	3/69 (4 PERCENT)	18 - 930
ALDRIN	3/69 (4 PERCENT)	16 - 200
ENDRIN KETONE	3/69 (4 PERCENT)	16* - 80
HEPTACHLOR EPOXIDE	1/69 (1 PERCENT)	10*

\* INDICATED CONCENTRATION BELOW TWO TIMES THE CRDL.

TOTAL PESTICIDE CONCENTRATIONS AT THE SHALLOW INTERVAL (2-3 FEET) RANGED FROM NON-DETECT (ND) TO 214,230 UG/KG, WHILE THOSE AT THE DEEPER INTERVAL (5-6 FEET) RANGED FROM ND TO 14,770 UG/KG. TOTAL PESTICIDE CONCENTRATIONS INCREASED WITH DEPTH ONLY AT STATIONS SSS-310, -317, 318, -334, AND -338. BECAUSE MUCH OF THE AREA HAS BEEN DISTURBED DURING THE EXCAVATION OF THE BURIED TRENCHES, IT IS UNKNOWN WHETHER THE ELEVATED LEVELS FOUND AT DEPTH ARE DUE TO DOWNWARD MIGRATION OF THE CONTAMINANTS OR ARE RESIDUES OF BURIED MATERIAL. TOTAL PESTICIDE CONCENTRATIONS IN THE SURFACE SOILS ARE SHOWN IN FIGURE 11.

SEVERAL METALS WERE DETECTED IN THE 6 SAMPLES COLLECTED FOR THIS ANALYSIS IN CONCENTRATIONS GREATER THAN 2 TIMES THE CRDL. THESE CONTAMINANTS INCLUDED ALUMINUM, CHROMIUM, IRON, LEAD, MAGNESIUM, MANGANESE, VANADIUM, AND ZINC. THE SIX SAMPLES COLLECTED FOR METALS ANALYSIS WERE

ALSO ANALYZED FOR PERCENT MOISTURE (5 - 9 PERCENT), TOTAL ORGANIC CARBON (ND - 2,200 MG/KG), AND CATION EXCHANGE CAPACITY (3.4 - 11 MG/KG).

BASED ON THE QUALIFICATIONS REQUIRED FOR THE BASELINE RISK ASSESSMENT, THE FOLLOWING ORGANIC COMPOUNDS WERE EVALUATED AS CONTAMINANTS OF CONCERN FOR THE SURFICIAL SOIL MEDIA AT THE FAIRWAY SIX AREA: ALPHA-BHC, BETA-BHC, GAMMA-BHC, DELTA-BHC, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, ALDRIN, DIELDRIN, DELTA-CHLORDANE, HEPTACHLOR, HEPTACHLOR EPOXIDE, TOXAPHENE, AND ENDRIN KETONE. THE METAL CONTAMINANTS OF CONCERN INCLUDE CHROMIUM, BARIUM, COPPER, MANGANESE, MERCURY, VANADIUM AND ZINC.

ADDITIONAL SOIL SAMPLES WERE COLLECTED FROM THE FAIRWAY SIX AREA STOCKPILE DURING THE WEEKS OF JULY 23 AND NOVEMBER 12, 1990. FIGURE 11A IDENTIFIES THE SAMPLE LOCATIONS. THREE COMPOSITE SOIL SAMPLES WERE COLLECTED FROM THE 22,000 CY STOCKPILE. THESE SAMPLES WERE ANALYZED FOR THE SAME SPECIFIC PESTICIDES AND VOCS DISCUSSED FOR THE FARM CHEMICALS AREA, AS WELL AS THE FULL-SCAN PESTICIDES, PCBS, AND PURGEABLE ORGANIC COMPOUNDS. THE CONTAMINANTS DETECTED IN SOIL AND THEIR CONCENTRATIONS ARE PRESENTED BELOW:

CONTAMINANT	CONCENTRATION RANGE (UG/KG)
4,4'-DDD	90,000 - 210,000
4,4'-DDT	140,000 - 210,000
ALDRIN	1,700 - 3,600
ALPHA-BHC	39,000 - 170,000
BETA-BHC	8,600 - 31,000
DELTA-BHC	3,500 - 20,000
DIELDRIN	13,000 - 16,000
GAMMA-BHC	4,200 - 12,000
ENDOSULFAN I	ND - 6,400
ENDOSULFAN II	ND - 1,300
CHLORDENE/2	1,800 - 5,100
ALPHA-CHLORDENE/2	420 - 1,500
GAMMA-CHLORDENE/2	660 - 2,600
TRANS-NONACHLOR/2	ND - 1,400
2,4'-DDD	37,000 - 63,000
2,4'-DDT	25,000 - 49,000
HEPTACHLOR	480 - 6,500
ALPHA-CHLORDANE	ND - 7,100
GAMMA-CHLORDANE	6,300 - 17,000
TOXAPHENE	130,000 - 840,000
CARBON DISULFIDE	7.9 - 200,000

ALTHOUGH SEVIN (CARBARYL) WAS ANALYZED FOR BUT NOT DETECTED IN SAMPLES COLLECTED BY EPA, IT WAS REPORTED DETECTED IN SAMPLES COLLECTED BY UNION CARBIDE IN MAY 1990. THREE SOIL SAMPLES COLLECTED FROM THE FAIRWAY SIX STOCKPILE REVEALED SEVIN IN THE SOIL AT CONCENTRATIONS OF 150, 270 AND 100 UG/KG. THESE RESULTS ARE DOCUMENTED IN UNION CARBIDE'S JULY 1990 MONTHLY PROGRESS REPORT LOCATED IN THE ADMINISTRATIVE RECORD FILE.

#### 5.3.3 SUBSURFACE SOILS (FAIRWAY SIX AREA)

THREE SUBSURFACE SOIL SAMPLES WERE GENERALLY COLLECTED FROM EACH OF THE SIX ON-SITE MONITORING WELLS: ONE ABOVE THE WATER TABLE ("A"), ONE FROM THE CAPILLARY FRINGE ZONE ("B"), AND ONE FROM THE WELL SCREEN INTERVAL ("C"). A TOTAL OF 18 SAMPLES WERE COLLECTED FROM 7 TO 115 FEET BELOW GRADE AND WERE ANALYZED FOR PESTICIDES, PCBS, VOCS, AND TCL METALS. ONE SAMPLE WAS ANALYZED FOR CEC. SAMPLES COLLECTED FROM BORING 3-MW-01 (SUB-301) WERE USED TO EVALUATE BACKGROUND CONDITIONS. THE SIGNIFICANT SUBSURFACE SOIL CONTAMINANTS AND THEIR MAXIMUM CONCENTRATIONS ARE PRESENTED IN TABLE 6.

BORINGS FOR WELLS 3-MW-02, 3-MW-03, AND 3-MW-04 WERE CONTAMINATED WITH AT LEAST TWO BHC ISOMERS, 4,4'-DDT AND 4,4'-DDD. SAMPLE SUB-303A, COLLECTED AT A DEPTH OF 13.5 FEET, CONTAINED THE GREATEST CONCENTRATION OF TOTAL PESTICIDES, 1,702 UG/KG. THE TOTAL PESTICIDE CONCENTRATIONS IN SUBSURFACE SOILS ARE SHOWN IN FIGURE 11.

ACETONE WAS FOUND IN BOTH THE SHALLOW AND MID-LEVEL DEPTH SAMPLES IN BORING 3-MW-02 AT CONCENTRATIONS OF 5,400 AND 560 UG/KG, RESPECTIVELY. ACETONE WAS ALSO DETECTED IN THE DEEPEST SAMPLE AT 3-MW-03 AND 3-MW-04 AT 500 AND 460 UG/KG, RESPECTIVELY. CARBON DISULFIDE WAS PRESENT IN SAMPLE 3-MW-06 AT A CONCENTRATIONS OF 60 UG/KG. PCBS WERE NOT DETECTED IN ANY OF THESE SAMPLES.

SEVERAL METALS WERE DETECTED IN THE SUBSURFACE SOIL SAMPLES AT CONCENTRATIONS GREATER THAN 2 TIMES THE CRDL. THESE CONTAMINANTS INCLUDE ALUMINUM, CHROMIUM, COPPER, IRON, LEAD, MANGANESE, AND VANADIUM. TOTAL ORGANIC CARBON WAS DETECTED IN 4 OF THE 5 ON-SITE BORINGS RANGING FROM ND TO 1,700 MG/KG. THESE LEVELS GENERALLY DECREASED WITH DEPTH. A CATION EXCHANGE CAPACITY OF 103 MG/KG WAS OBSERVED FOR SAMPLE SUB-303C SUBSURFACE SOIL CONTAMINANTS OF CONCERN MEETING THE MINIMUM CONCENTRATIONS REQUIREMENTS FOR EVALUATION UNDER THE BASELINE RISK ASSESSMENT ARE AS FOLLOWS: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, ALPHA-BHC, BETA-BHC, DELTA-BHC, AND GAMMA-BHC. MANGANESE WAS THE ONLY METAL CONTAMINANT EVALUATED FOR THIS AREA.

#### 5.3.3 AIR (FAIRWAY SIX AREA)

ONE AIR SAMPLE COLLECTED AT THE FAIRWAY SIX AREA WAS ANALYZED FOR PESTICIDES AND PCBS. THIS SAMPLE WAS CONTAMINATED WITH ALPHA-BHC, BETA-BHC, HEPTACHLOR, 4,4'-DDD, 4,4'-DDE, AND 4,4'-DDT. CONCENTRATIONS FOR THESE CONTAMINANTS RANGED FROM 0.006 TO 0.035 UG/M3. PCBS WERE NOT DETECTED IN THIS SAMPLE.

#### 5.3.4 AREA OF CONTAMINATION (FAIRWAY SIX AREA)

RESIDUAL LEVELS FOR TOTAL PESTICIDE CONTAMINATION EXCEEDED 214,230 UG/KG FOR SURFACE SOIL SAMPLES. TOTAL PESTICIDE LEVELS UP TO 1,702 UG/KG WERE ALSO DETECTED IN THE SUBSURFACE SOIL SAMPLES. TO OBTAIN THE TARGET (10-6) HEALTH-BASED CLEANUP LEVEL FOR THIS AREA, THE ESTIMATED VOLUME OF MATERIAL REQUIRING REMEDIATION IS 444,220 CUBIC FEET, OR 16,453 CUBIC YARDS. AN ADDITIONAL 22,000 CUBIC YARDS OF MATERIAL STOCKPILED AT THIS AREA DURING THE EMERGENCY REMOVAL ACTION CONDUCTED IN 1988 WILL ALSO REQUIRE REMEDIATION, WHICH IS THE DISCUSSION OF SECTION 10 OF THIS DOCUMENT. AREAS REQUIRING EXCAVATION ARE PRESENTED IN FIGURE 12.

#### 5.4 MCIVER DUMP AREA

THE MCIVER DUMP AREA CONSISTS OF THREE DISPOSAL AREAS (AREA "A", "B", AND "C"). AREA A WAS INVESTIGATED BY THE STATE OF NORTH CAROLINA AND WAS NOT A PART OF EPA'S REMEDIAL INVESTIGATION. AREA C IS AN AREA WHICH UNDERWENT A REMOVAL ACTION IN THE SPRING OF 1989. NO SAMPLES WERE COLLECTED FROM AREA C BY THE REMEDIAL CONTRACTOR. THE FOLLOWING DISCUSSION DESCRIBES THE FINDINGS OF THE RI AT AREA B.

##### 5.4.1 SURFACE SOILS (MCIVER DUMP AREA)

ONE BACKGROUND STATION (SSS-407) WAS SELECTED FOR THE MCIVER DUMP AREA AND WAS LOCATED 400 FEET SOUTHWEST OF AREA B. THIS SAMPLE WAS COLLECTED AT A DEPTH OF 3-4 FEET. A TOTAL OF 8 STATIONS WERE SAMPLED WITHIN THE GRID OF AREA B. SAMPLES WERE COLLECTED AT DEPTHS OF 3-4 AND 5-6 FEET AT SEVEN OF THESE STATIONS, TWO OF WHICH ALSO HAD SURFICIAL SAMPLES COLLECTED. STATION SSS-403 WAS SAMPLED AT 3-4 FEET ONLY DUE TO AUGER REFUSAL. A SINGLE SAMPLE (SSS-404) WAS SPLIT AND ANALYZED FOR TCL METALS, TOC, CEC, AND PERCENT MOISTURE. THIS YIELDED 19 SAMPLES COLLECTED FOR PESTICIDE ANALYSIS (INCLUDING 1 DUPLICATE). TABLE 7 LISTS THE SAMPLES COLLECTED IN SOIL IN ADDITION TO THE TYPE OF ANALYSIS PERFORMED ON THESE SAMPLES. THE SIGNIFICANT CONTAMINANTS AND THEIR MAXIMUM CONCENTRATIONS FOR ALL MEDIA AT THE MCIVER DUMP AREA ARE PRESENTED IN TABLE 8.

THE BACKGROUND SAMPLE (SSS-407) REVEALED NO PESTICIDE CONTAMINATION. OF THE 8 SOIL SAMPLING STATIONS COLLECTED AT AREA B, 6 REVEALED DETECTABLE LEVELS OF PESTICIDES, WITH ALL BUT ONE CONTAINING AT LEAST 4 DIFFERENT PESTICIDES. BHC ISOMERS DETECTED IN THE SURFICIAL SOIL SAMPLES INCLUDED ALPHA-BHC, BETA-BHC, GAMMA-BHC, AND DELTA-BHC IN CONCENTRATIONS (UG/KG) UP TO 430,000, 79,000, 16,000, AND 32,000, RESPECTIVELY. OTHER PESTICIDES DETECTED INCLUDED 4,4'-DDT, -DDD, -DDE, AND TOXAPHENE IN CONCENTRATIONS (UG/KG) UP TO 180,000, 22,000, 7,400, AND 160,000, RESPECTIVELY. STATIONS SSS-401, SSS-404, AND SSS-405 CONTAINED THE HIGHEST CONCENTRATION OF TOTAL PESTICIDES AT ALL DEPTH INTERVALS. THE TOTAL PESTICIDE CONCENTRATION AT BOTH DEPTH

INTERVALS IN THE SURFICIAL SOILS APPEARS TO BE ASSOCIATED WITH PROXIMITY TO THE EXCAVATED AREA B. IT SHOULD BE NOTED THAT SAMPLES SSS-402 AND SSS-406, COLLECTED FROM THE EXCAVATION AREA, CONTAINED LITTLE OR NO PESTICIDE CONTAMINATION. FIGURE 13 SHOWS THE TOTAL PESTICIDE CONCENTRATIONS FOR THE SURFICIAL SOILS.

THE PESTICIDES DETECTED, THEIR FREQUENCY OF DETECTION, AND CONCENTRATION RANGES ARE SUMMARIZED BELOW.

PESTICIDE SPECIES	FREQUENCY OF DETECTION	CONCENTRATION RANGE (UG/KG)
4,4'-DDT	10/18 (56 PERCENT)	85 - 180,000
ALPHA-BHC	10/18 (56 PERCENT)	20 - 430,000
BETA-BHC	9/18 (50 PERCENT)	35 - 79,000
DELTA-BHC	7/18 (39 PERCENT)	11* - 32,000
GAMMA-BHC (LINDANE)	6/18 (33 PERCENT)	10* - 16,000
4,4'-DDD	5/18 (28 PERCENT)	87 - 22,000
4,4'-DDE	4/18 (22 PERCENT)	21* - 7,400
TOXAPHENE	2/18 (11 PERCENT)	11,000 - 160,000

\* INDICATED CONCENTRATION BELOW TWO TIMES THE CRDL.

A SINGLE ON-SITE STATION (SSS-404) WAS ANALYZED FOR TCL METALS. BECAUSE THE BACKGROUND SURFICIAL SOIL STATION WAS NOT ANALYZED FOR METALS, THE SHALLOW SUBSURFACE SOIL SAMPLE FOR THE BACKGROUND WELL FOR THIS AREA WAS USED AS A COMPARATIVE BACKGROUND SAMPLE. THE METALS DETECTED IN THE ON-SITE SURFICIAL SOIL SAMPLE WERE TYPICAL OF THE ABERDEEN AREA AND WERE COMPARABLE IN CONCENTRATION TO THE BACKGROUND SAMPLE. METALS DETECTED AT 2 TIMES THE CRDL INCLUDE ALUMINUM, CHROMIUM, AND MANGANESE, AT CONCENTRATIONS (MG/KG) OF 2,100, 4.3, AND 10, RESPECTIVELY.

BASED ON THE QUALIFICATIONS REQUIRED FOR THE BASELINE RISK ASSESSMENT, THE FOLLOWING ORGANIC COMPOUNDS WERE EVALUATED AS CONTAMINANTS OF CONCERN FOR THE SURFICIAL SOIL MEDIA AT THE MCIVER DUMP AREA: ALPHA-BHC, BETA-BHC, GAMMA-BHC, DELTA-BHC, 4,4-DDD, 4,4-DDE, 4,4-DDT, AND TOXAPHENE. THE METAL CONTAMINANTS OF CONCERN INCLUDE MANGANESE AND ZINC.

#### 5.4.2 SUBSURFACE SOILS (MCIVER DUMP AREA)

THREE SUBSURFACE SOIL SAMPLES WERE COLLECTED FROM EACH BORING FOR THE 2 MONITORING WELLS INSTALLED FOR THIS AREA. THESE SAMPLES WERE COLLECTED ABOVE THE WATER TABLE (SUFFIX "A"), ONE FROM THE CAPILLARY FRINGE ZONE ("B"), AND ONE FROM THE INTERVAL WHERE THE WELL SCREEN WAS INSTALLED ("C"). DEPTHS FOR THESE SAMPLES RANGED FROM 6 TO 64 FEET BELOW GRADE. ALL SAMPLES WERE ANALYZED FOR PESTICIDES, PCBS, VOCs, AND TCL METALS. THE SIGNIFICANT SUBSURFACE SOIL CONTAMINANTS AND THEIR MAXIMUM CONCENTRATIONS ARE PRESENTED IN TABLE 8.

NO PESTICIDES WERE DETECTED AT A DEPTH OF 6 FEET IN THE BACKGROUND SAMPLE SUB-401A. AT A DEPTH OF 16.6 FEET, BACKGROUND SAMPLE SUB-401B CONTAINED A TRACE OF ALPHA-BHC (27 UG/KG) BUT IS NOT THOUGHT TO BE SITE-RELATED AND MAY INDICATE ANOTHER SOURCE OF CONTAMINATION. NO PCBS WERE DETECTED IN ANY SAMPLES COLLECTED FROM THIS BORING. THE ON-SITE BORINGS REVEALED CONSIDERABLE SUBSURFACE CONTAMINATION WITH PESTICIDES. BHC ISOMERS WERE COMMON TO ALL THE ON-SITE SAMPLES WITH THE SHALLOWEST INTERVAL AT 8 FEET (SUB-402A) CONTAINING SEVERAL OTHER PESTICIDES INCLUDING 4,4'-DDT, 4,4'-DDD, 4,4'-DDE, TOXAPHENE, AND TOTAL CHLORDANE IN CONCENTRATIONS (UG/KG) OF 1,700, 320, 83, 2,600, AND 55, RESPECTIVELY. FIGURE 13 SHOWS THE TOTAL PESTICIDE CONCENTRATIONS FOR THE SUBSURFACE SOILS.

SAMPLE SUB-402B CONTAINED THE ONLY SIGNIFICANT LEVELS OF VOCs - ACETONE (260 UG/KG) AND CHLOROBENZENE (45 UG/KG). TRACE LEVELS OF XYLENE AND CHLOROBENZENE WERE PRESENT IN SAMPLES SUB-402B AND SUB-402C, RESPECTIVELY. TOTAL ORGANIC CARBON ANALYSIS WAS PERFORMED ON ALL SAMPLES COLLECTED FROM STATION SUB-402 WITH A RANGE OF 230-1,400 MG/KG. A SINGLE SAMPLE (SUB-402C) WAS ANALYZED FOR CATION EXCHANGE CAPACITY WHICH WAS DETECTED AT 3.4 MG/KG.

SEVERAL METALS WERE DETECTED FROM THE ON-SITE STATION FOR THIS AREA. THE FOLLOWING METALS WERE

PRESENT IN CONCENTRATIONS GREATER THAN 2 TIMES THE CRDL: ALUMINUM, CALCIUM, CHROMIUM, IRON, LEAD, MANGANESE, AND VANADIUM.

BASED ON THE QUALIFICATIONS REQUIRED FOR THE BASELINE RISK ASSESSMENT, THE FOLLOWING ORGANIC COMPOUNDS WERE EVALUATED AS CONTAMINANTS OF CONCERN: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, ALPHA-BHC, BETA-BHC, DELTA-BHC, GAMMA-BHC, ALPHA-CHLORDANE, DELTA-CHLORDANE, TOXAPHENE, CHLOROBENZENE, ACETONE, AND XYLENE. THE METAL CONTAMINANTS OF CONCERN INCLUDED: BARIUM AND MANGANESE.

#### 5.4.3 AREA OF CONTAMINATION (MCIVER DUMP AREA)

TOTAL PESTICIDE LEVELS EXCEEDED 926,400 UG/KG FOR SURFACE SOIL COLLECTED WEST OF AREA "A". A SINGLE SUBSURFACE STATION (SUB-402) PRESENTED A MAXIMUM TOTAL PESTICIDE CONCENTRATION OF 4,921 UG/KG AT A DEPTH OF 8 FEET. TO ADEQUATELY QUANTIFY THE EXTENT OF SUBSURFACE SOIL CONTAMINATION, ADDITIONAL SAMPLES WILL BE REQUIRED.

TO OBTAIN THE TARGET (10-6) HEALTH-BASED CLEANUP LEVEL FOR THIS AREA, THE ESTIMATED VOLUME OF MATERIAL REQUIRING REMEDIATION IS 74,000 CUBIC FEET, OR 2,740 CUBIC YARDS. AN ADDITIONAL 3,200 CUBIC YARDS OF MATERIAL CURRENTLY STOCKPILED AT THIS SITE DURING THE EMERGENCY REMOVAL ACTION CONDUCTED IN MAY 1989 WILL ALSO REQUIRE REMEDIATION. AREAS REQUIRING REMEDIATION ARE PRESENTED IN FIGURE 14.

#### 5.5 ROUTE 211 AREA

##### 5.5.1 SURFACE SOILS (ROUTE 211 AREA)

A TOTAL OF FIVE SAMPLING STATIONS WERE SELECTED FOR THIS AREA IN ADDITION TO A BACKGROUND STATION LOCATED 200 FEET NORTHWEST OF THE SAND BASIN AND LABELED SSS-591. THE FIVE ON-SITE SURFACE SOIL SAMPLES WHICH WERE LOCATED WITHIN THE OLD SAND MINING BASIN WERE ANALYZED FOR PESTICIDES. A TOTAL OF 10 SAMPLES WERE COLLECTED FROM THIS AREA AND ANALYZED FOR PESTICIDES. SURFACE SOIL SAMPLE SSS-502B WAS THE ONLY SAMPLE ANALYZED FOR METALS AT THIS AREA. TABLE 9 LISTS THE SOIL SAMPLES COLLECTED IN ADDITION TO THE TYPE OF ANALYSIS PERFORMED ON THESE SAMPLES. THE SIGNIFICANT CONTAMINANTS AND THEIR MAXIMUM CONCENTRATIONS FOR ALL MEDIA AT THE ROUTE 211 AREA ARE PRESENTED IN TABLE 10.

FOUR OF THE FIVE SURFACE SOIL SAMPLE STATIONS EXHIBITED CONTAMINATION WITH PESTICIDES. THESE PESTICIDES INCLUDE ALPHA-BHC, BETA-BHC, DELTA-BHC, AND GAMMA-BHC, 4,4'-DDT, 4,4'-DDD, AND TOXAPHENE IN CONCENTRATIONS (UG/KG) UP TO 2,200,000, 120,000, 18,000, 41,000, 60,000, 1,200,000, AND 2,300,000, RESPECTIVELY. STATION SSS-501, LOCATED IN THE CENTER OF THE BASIN, WAS THE MOST CONTAMINATED WITH TOTAL PESTICIDE CONCENTRATIONS OF 5,939,000, 36,430, AND 59,650 UG/KG AT DEPTHS OF 0, 2, AND 5 FEET BELOW GRADE, RESPECTIVELY. SAMPLE SSS-505, LOCATED ON THE WESTERN SIDE OF THE BASIN, WAS THE SECOND MOST CONTAMINATED SURFICIAL SOIL SAMPLE LOCATION. TOXAPHENE COMPRISED OVER 99 PERCENT OF THE TOTAL PESTICIDE CONTAMINATION OF 200,360 AND 13,075 UG/KG AT DEPTHS OF 2 AND 5 FEET BELOW GRADE, RESPECTIVELY. FIGURE 15 SHOWS THE TOTAL PESTICIDE CONCENTRATIONS IN THE SURFACE SOILS.

SEVERAL METALS WERE DETECTED IN THE SINGLE ON-SITE SAMPLE ANALYZED FOR METALS IN CONCENTRATIONS UP TO 2 TIMES THE CRDL. THE CONTAMINANTS DETECTED IN THIS SAMPLE INCLUDED MAGNESIUM, MANGANESE, AND MERCURY IN CONCENTRATIONS (MG/KG) OF 3,800, 1,200, AND 4,800, RESPECTIVELY. THE MERCURY CONCENTRATION IN THIS SAMPLE FAR EXCEEDED THE CONCENTRATIONS DETECTED FOR ANY OTHER AREA. TO QUALIFY THE EXTENT OF MERCURY PRESENT FOR THIS AREA, ADDITIONAL SAMPLING WILL BE REQUIRED.

BASED ON THE QUALIFICATIONS REQUIRED FOR THE BASELINE RISK ASSESSMENT, THE FOLLOWING ORGANIC COMPOUNDS WERE EVALUATED AS CONTAMINANTS OF CONCERN FOR THE SURFICIAL SOIL MEDIA AT THE ROUTE 211 AREA: ALPHA-BHC, BETA-BHC, GAMMA-BHC, AND DELTA-BHC, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, AND TOXAPHENE. METALS OF CONCERN FOR THIS AREA INCLUDE NICKEL, BARIUM, COBALT, MANGANESE, MERCURY, AND THALLIUM.

##### 5.5.2 SUBSURFACE SOILS (ROUTE 211 AREA)

THREE BORING LOCATIONS ADJACENT TO THE SAND BASIN WERE UTILIZED FOR THE COLLECTION OF SUBSURFACE

SOIL SAMPLES. A TOTAL OF 9 SAMPLES WERE COLLECTED FROM 5 TO 32 FEET BELOW GRADE AND ANALYZED FOR PESTICIDES, PCBS, VOCs, AND TCL METALS. STATION SUB-501 LOCATED AT BORING 5-MW-01 IS CONSIDERED TO BE EITHER UPGRADIENT OR SIDEGRADIENT OF THE AREAS OF KNOWN CONTAMINATION BASED ON GROUNDWATER FLOW DIRECTION TO THE WEST-NORTHWEST OR TO THE SOUTHEAST. THE SIGNIFICANT SUBSURFACE SOIL CONTAMINANTS AND THEIR MAXIMUM CONCENTRATIONS ARE PRESENTED IN TABLE 10.

BOTH 4,4'-DDT AND TOXAPHENE WERE DETECTED IN BORING 5-MW-03 AT CONCENTRATIONS (UG/KG) OF 33,000 AND 63,000, RESPECTIVELY. TRACE AMOUNTS OF 4,4'-DDT WERE DETECTED IN BORING 5-MW-02 AT 5 AND 15 FEET BELOW GRADE. TOTAL PESTICIDE CONCENTRATION FOR THE SUBSURFACE SOILS ARE SHOWN IN FIGURE 15.

ACETONE WAS THE PRIMARY VOC CONTAMINANT IN THE SUBSURFACE SOIL SAMPLES. THE HIGHEST CONCENTRATION (3,300 MG/KG) WAS PRESENT IN BORING 5-MW-03 AT 7 FEET BELOW GRADE. ACETONE WAS ALSO DETECTED IN BORING 5-MW-02 AT 15 AND 24 FEET BELOW GRADE IN CONCENTRATIONS OF 1,100 AND 750 UG/KG, RESPECTIVELY. TRACE AMOUNTS OF CHLOROFORM, BROMODICHLOROMETHANE, TRICHLOROETHENE, AND TOLUENE WERE ALSO DETECTED IN BORING 5-MW-02.

SEVERAL METALS WERE DETECTED IN SAMPLES COLLECTED ON-SITE WHICH EXCEEDED 2 TIMES THE CRDL. THESE CONTAMINANTS INCLUDE ALUMINUM, CHROMIUM, IRON, LEAD, AND MANGANESE.

SUBSURFACE SOIL CONTAMINANTS MEETING THE MINIMUM CONCENTRATION REQUIREMENTS FOR EVALUATION UNDER THE BASELINE RISK ASSESSMENT ARE: ACETONE, TOLUENE, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, ALPHA-BHC, BETA-BHC, GAMMA-BHC, DELTA-BHC, AND TOXAPHENE. METAL CONTAMINANTS EVALUATED FOR THIS AREA INCLUDE LEAD, MANGANESE, AND BARIUM.

#### 5.5.3 AREA OF CONTAMINATION (ROUTE 211 AREA)

RESIDUAL LEVELS FOR TOTAL PESTICIDE CONTAMINATION DOCUMENTED IN THE RI EXCEEDED 5,000,000 UG/KG IN SURFACE SOILS NEAR THE CENTER OF THE BASIN. TOTAL PESTICIDE LEVELS UP TO 13,075 UG/KG WERE ALSO DETECTED AT DEPTHS UP TO 5 FEET FOR THE WESTERN SECTION OF THE BASIN. A SUBSURFACE SOIL SAMPLE COLLECTED 20 FEET EAST OF THE BASIN NEAR MONITORING WELL 5-MW-03 CONTAINED 96,000 UG/KG OF TOTAL PESTICIDES (4,4-DDT AND TOXAPHENE). THIS ELEVATED LEVEL MAY BE INDICATIVE OF ADDITIONAL BURIED MATERIAL AND MAY ALSO REQUIRE REMEDIAL ACTION.

TO OBTAIN THE TARGET 10-6 HEALTH-BASED CLEANUP LEVEL FOR THIS AREA, THE ESTIMATED VOLUME OF MATERIAL REQUIRING REMEDIATION IS 121,000 CUBIC FEET, OR 4,481 CUBIC YARDS. FIGURE 16 SHOWS THE AREA OF CONTAMINATED SOIL REQUIRING REMEDIATION.

## #SSR

### 6.0 SUMMARY OF SITE RISKS

THE ABERDEEN PESTICIDES DUMPS SITE IS RELEASING CONTAMINANTS TO THE ENVIRONMENT. CHAPTER 6 OF THE RI ENTITLED "BASELINE RISK ASSESSMENT" PRESENTS THE RESULTS OF A COMPREHENSIVE RISK ASSESSMENT THAT ADDRESSES THE POTENTIAL THREATS TO PUBLIC HEALTH AND THE ENVIRONMENT POSED BY THE SITE UNDER CURRENT AND FUTURE CONDITIONS ASSUMING THAT NO REMEDIAL ACTIONS TAKE PLACE AND THAT NO RESTRICTIONS ARE PLACED ON FUTURE USE OF THE SITE.

THE RISK ASSESSMENT CONSISTS OF HAZARD IDENTIFICATION OF THE CONTAMINANTS OF CONCERN, AN EXPOSURE ASSESSMENT, IDENTIFICATION OF TOXICOLOGICAL CRITERIA, AND RISK CHARACTERIZATION. BECAUSE THE SITE CONSISTS OF FIVE SEPARATE AREAS, EACH AREA WAS TREATED SEPARATELY IN THE RISK ASSESSMENT. EACH PART OF THE RISK ASSESSMENT IS DISCUSSED BELOW.

#### 6.1 CONTAMINANTS OF CONCERN

DATA COLLECTED DURING THE RI WERE REVIEWED AND EVALUATED TO DETERMINE THE "CONTAMINANTS OF CONCERN" AT THE SITE WHICH ARE MOST LIKELY TO POSE RISKS TO PUBLIC HEALTH. THESE CONTAMINANTS WERE CHOSEN FOR EACH ENVIRONMENTAL MEDIA SAMPLED (E.G., GROUNDWATER, SURFICIAL SOIL), BASED ON SCREENING CRITERIA INCLUDING FREQUENCY OF OCCURRENCE IN EACH MEDIA, PRESENCE AT LEVELS CONSIDERED TO BE GREATER THAN BACKGROUND, ASSOCIATION WITH SITE ACTIVITIES, EITHER DUE TO SITE-RELATED CONCENTRATION GRADIENTS OR THROUGH HISTORICAL DATA ON WASTE DISPOSAL, AND

COMPARISON OF LEVELS FOUND IN QUALITY CONTROL (QC) SAMPLES, IF APPLICABLE.

ONCE THESE CONTAMINANTS OF CONCERN WERE IDENTIFIED, EXPOSURE CONCENTRATIONS IN EACH MEDIA WERE ESTIMATED. THE MAXIMUM CONCENTRATIONS DETECTED WERE COMPARED TO THE CALCULATED 95 PERCENT CONFIDENCE LEVEL OF THE ARITHMETIC AVERAGE OF ALL DETECTS, AND THE LOWER OF THESE VALUES WAS CHOSEN AS THE ESTIMATED EXPOSURE CONCENTRATION. TABLE 11 IDENTIFIES THE CONTAMINANTS OF CONCERN FOR EACH AREA AND THE REASONABLE MAXIMUM EXPOSURE CONCENTRATION IN EACH MEDIA SAMPLED WHICH WAS ANALYZED IN THE RISK ASSESSMENT.

## 6.2 EXPOSURE ASSESSMENT

THE EXPOSURE ASSESSMENT IDENTIFIED POTENTIAL PATHWAYS AND ROUTES FOR CONTAMINANTS OF CONCERN TO REACH RECEPTORS AND THE ESTIMATED CONTAMINANT CONCENTRATION AT THE POINTS OF EXPOSURE. CONTAMINANT RELEASE MECHANISMS FROM ENVIRONMENTAL MEDIA, BASED ON RELEVANT HYDROLOGIC AND HYDROGEOLOGIC INFORMATION (FATE AND TRANSPORT, AND OTHER PERTINENT SITE-SPECIFIC INFORMATION, SUCH AS LOCAL LAND AND WATER USE OR DEMOGRAPHIC INFORMATION), WERE ALSO PRESENTED.

TABLES 12 AND 13 PROVIDES THE ESTIMATED EXPOSURE FREQUENCIES AND ESTIMATED TIME OF EXPOSURE PER EVENT FOR TARGET POPULATIONS UNDER CURRENT AND FUTURE LAND USE CONDITIONS AT THE SITE. CURRENT AND FUTURE LAND USE CONDITIONS FOR EACH AREA ARE DISCUSSED BELOW.

THE FARM CHEMICALS AREA IS LOCATED IN A RESIDENTIAL/INDUSTRIAL ZONE. THE PROPERTY IS SECURED BY A CHAINLINK FENCE. CURRENTLY, FARM CHEMICALS HAS CLOSED ITS OPERATION AT THE FACILITY, THEREFORE A CURRENT ON-SITE WORKER SCENARIO WAS NOT ASSUMED. SINCE THE AREA IS TOTALLY FENCED IN AND LOCKED, CURRENT SITE TRESPASSING IS HIGHLY UNLIKELY. AT THE TIME OF THE REMEDIAL INVESTIGATION, AN EMPLOYEE OF FARM CHEMICALS WAS LIVING AT THE AREA OR AT LEAST SPENDING A FEW NIGHTS A WEEK THERE. FOR FUTURE LAND USE THIS AREA MAY BE REOPENED AS A PESTICIDE BLENDED/MIXING PRODUCTION FACILITY OR BE CONVERTED INTO A RESIDENTIAL COMMUNITY. THUS, THE TARGET POPULATIONS AT THE FARM CHEMICALS AREA UNDER CURRENT AND FUTURE LAND USE ARE:

- ON-SITE ADULT AND CHILD RESIDENTS (CURRENT & FUTURE)
- ON-SITE ADULT WORKERS (FUTURE)

THE TWIN SITES AREA, LOCATED APPROXIMATELY 400 FEET NORTH OF THE FARM CHEMICALS AREA, IS IN AN OPEN AREA SURROUNDED BY WOODS. THE NEAREST RESIDENTS LIVE ABOUT 350' UPGRADIENT FROM THE AREA. THIS AREA AND ITS SURROUNDINGS ARE ZONED RESIDENTIAL. HOWEVER, THE COUNTY MAY CHANGE THE ZONING TO RECREATIONAL USE, SINCE THE AREA IS APPROXIMATELY 350 FEET FROM PAGES LAKE. BASED ON THESE POSSIBILITIES OF FUTURE LAND USE AND CURRENT LAND USE CONDITIONS, THE TARGET POPULATIONS ARE:

- ADULT AND CHILD RESIDENTS NEARBY (CURRENT)
- SITE TRESPASSERS (CURRENT)
- ON-SITE ADULT AND CHILD RESIDENT (FUTURE)
- RECREATIONAL ADULT AND CHILD USERS (FUTURE)

THE FAIRWAY SIX AREA IS PARTIALLY LOCATED ON THE SIXTH FAIRWAY OF THE PIT GOLF LINKS GOLF COURSE. THE GOLF COURSE, LOCATED IN A RURAL, SPARSELY POPULATED AREA, IS FREQUENTLY VISITED BY GOLFERS AND WORKERS. THE SOUTHERN HALF OF THE AREA IS LOCATED ON PRIVATE PROPERTY WHICH COULD BE DEVELOPED INTO A RESIDENTIAL COMMUNITY. THUS, TARGET POPULATIONS UNDER CURRENT AND FUTURE LAND USE ARE:

- ON-SITE WORKERS (CURRENT AND FUTURE)
- RESIDENTS NEARBY OR SITE TRESPASSERS, ADULTS AND CHILDREN (CURRENT AND FUTURE)
- GOLFERS (CURRENT AND FUTURE)
- ON-SITE ADULT AND CHILD RESIDENT (FUTURE)

THE MCIVER DUMP AREA IS IN A SPARSELY POPULATED RURAL AREA ON LAND THAT IS PARTLY WOOD AND PARTLY CLEARED FOR AGRICULTURE. THIS AREA IS RESIDENTIALLY ZONED. DESPITE ITS REMOTE LOCATION, RESIDENTIAL HOUSING MAY BE BUILT AT THIS SITE IN THE FUTURE. THUS, THE TARGET POPULATIONS UNDER CURRENT AND FUTURE LAND USE ARE:



- RESIDENTS NEARBY OR SITE TRESPASSERS, ADULT AND CHILDREN (CURRENT)
- ON-SITE ADULT AND CHILD RESIDENTS (FUTURE)

THE ROUTE 211 AREA, LOCATED IN A SPARSELY POPULATED AREA, IS GENERALLY SURROUNDED BY PINE WOODS WITH SCATTERED ABANDONED SAND-MINING PITS. THE MINING MAY BE REACTIVATED IN THE FUTURE. HOWEVER, THE AREA IS ALSO LOCATED IN A ZONED RESIDENTIAL AREA, WHICH MAY BE DEVELOPED INTO A COMMUNITY IN THE FUTURE. TWO ACTIVE COMMERCIAL/INDUSTRIAL FACILITIES ARE LOCATED BETWEEN 1,000 - 2,000 FEET OF THE AREA. FOR A CONSERVATIVE RISK ASSESSMENT, THE TARGET POPULATIONS UNDER CURRENT AND FUTURE LAND USE ARE:

- RESIDENTS NEARBY OR SITE TRESPASSER, ADULTS AND CHILDREN (CURRENT)
- ON-SITE CHILD AND ADULT RESIDENTS (FUTURE)

THE EXPOSURE PATHWAYS FOR ALL AREAS UNDER CURRENT AND FUTURE LAND USE ARE SIMILAR OR ARE IDENTICAL. THE RISK TO FUTURE RESIDENTS AT MCIVER AND ROUTE 211 AREAS OF INGESTION OF CONTAMINATED FISH AND DERMAL CONTACT WITH OR INGESTION OF SEDIMENTS AND SURFACE WATER WAS ESTIMATED BY ASSUMING THAT THE FUTURE RESIDENTS AT BOTH AREAS WILL USE PAGES LAKE FOR RECREATIONAL PURPOSES. EXPOSURE PATHWAYS ARE:

DERMAL CONTACT WITH OR INGESTION OF SURFACE SOIL AND EXPOSED WASTES; INHALATION OF SUSPENDED PARTICULATE GENERATED FROM CONTAMINATED SOILS AND EXPOSED WASTES; DERMAL CONTACT WITH OR INGESTION OF SEDIMENTS AND SURFACE WASTE; INHALATION DURING SHOWERING WITH, DERMAL CONTACT WITH, AND INGESTION OF CONTAMINATED GROUNDWATER; INGESTION OF CONTAMINATED BIOTA AND FOOD.

### 6.3 SUMMARY OF TOXICOLOGICAL CRITERIA

AVAILABLE TOXICOLOGIC CRITERIA FOR CONTAMINANTS OF CONCERN ARE SUMMARIZED IN TABLE 14 AND ARE USED IN ESTIMATING RISKS TO SITE CONTAMINANTS. THIS TABLE CONTAINS INFORMATION ON:

#### CARCINOGENICITY

CARCINOGENIC WEIGHT OF EVIDENCE

TUMOR SITES VIA ORAL AND INHALATION ROUTES

CARCINOGENIC SLOPE FACTORS (Q\*) VIA ORAL AND INHALATION ROUTES

#### NONCARCINOGENICITY

CHRONIC AND SUBCHRONIC REFERENCE DOSES (RFDS) VIA ORAL AND INHALATION ROUTES

CHRONIC AND SUBCHRONIC CRITICAL EFFECTS VIA ORAL AND INHALATION ROUTES

SLOPE (Q\*) OR CANCER POTENCY FACTORS (CPF) HAVE BEEN DEVELOPED BY EPA'S CARCINOGENIC ASSESSMENT GROUP FOR ESTIMATING EXCESS LIFETIME CANCER RISKS ASSOCIATED WITH EXPOSURE TO POTENTIALLY CARCINOGENIC CHEMICALS. SLOPE FACTORS, WHICH ARE EXPRESSED IN UNITS OF (KG-DAY/MG), ARE MULTIPLIED BY THE ESTIMATED INTAKE OF A POTENTIAL CARCINOGEN, IN MG/KG-DAY, TO PROVIDE AN UPPER-BOUND ESTIMATE OF THE EXCESS LIFETIME CANCER RISK ASSOCIATED WITH EXPOSURE AT THAT INTAKE LEVEL. THE TERM "UPPERBOUND" REFLECTS THE CONSERVATIVE ESTIMATE OF THE RISKS CALCULATED FROM THE CPF. USE OF THIS APPROACH MAKES UNDERESTIMATION OF THE ACTUAL CANCER RISK HIGHLY UNLIKELY. CANCER POTENCY FACTORS ARE DERIVED FROM THE RESULTS OF HUMAN EPIDEMIOLOGICAL STUDIES OR CHRONIC ANIMAL BIOASSAYS TO WHICH ANIMAL-TO-HUMAN EXTRAPOLATION AND UNCERTAINTY FACTORS HAVE BEEN APPLIED.

REFERENCE DOSES (RFDS) HAVE BEEN DEVELOPED BY EPA FOR INDICATING THE POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM EXPOSURE TO CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS. RFDS, WHICH ARE EXPRESSED IN UNITS OF MG/KG-DAY, ARE ESTIMATES OF LIFETIME DAILY EXPOSURE LEVELS FOR HUMANS, INCLUDING SENSITIVE INDIVIDUALS. ESTIMATED INTAKES OF CHEMICALS FROM ENVIRONMENTAL MEDIA (E.G., THE AMOUNT OF A CHEMICAL INGESTED FROM CONTAMINATED DRINKING WATER) CAN BE COMPARED TO THE RFD. RFDS ARE DERIVED FROM HUMAN EPIDEMIOLOGICAL STUDIES OR ANIMAL STUDIES TO WHICH UNCERTAINTY FACTORS HAVE BEEN APPLIED (E.G., TO ACCOUNT FOR THE USE OF ANIMAL DATA TO PREDICT EFFECTS ON HUMANS). THESE UNCERTAINTY FACTORS HELP ENSURE THAT THE RFDS WILL NOT UNDERESTIMATE THE POTENTIAL FOR ADVERSE NONCARCINOGENIC EFFECTS TO OCCUR.

### 6.4 RISK CHARACTERIZATION

USING THE INPUT PARAMETERS DESCRIBED ABOVE, LIFETIME EXCESS CANCER RATES (LECRS), WHICH ESTIMATE THE CARCINOGENIC RISKS POSED BY THE CONTAMINANTS OF CONCERN AT THE ABERDEEN PESTICIDE DUMPS SITE WERE CALCULATED. THIS UNIT OF RISK ESTIMATES THE NUMBER OF EXCESS CANCER CASES CAUSED BY EXPOSURE TO THE SITE CONTAMINANTS (E.G., AN LECR OF  $1 \times (10^{-6})$  MEANS THAT AS A PLAUSIBLE UPPERBOUND, 1 EXCESS CASE OF CANCER PER 1,000,000 PEOPLE COULD BE EXPECTED AS A RESULT OF A SITE RELATED EXPOSURE TO A CARCINOGEN OVER A 70 YEAR LIFETIME UNDER THE SPECIFIC EXPOSURE CONDITIONS AT THE SITE). THE AGENCY CONSIDERS INDIVIDUAL EXCESS CANCER RISKS IN THE RANGE OF  $(10^{-4})$  TO  $(10^{-6})$  AS PROTECTIVE; HOWEVER, THE  $(10^{-6})$  RISK LEVEL IS GENERALLY USED AS THE POINT OF DEPARTURE FOR SETTING CLEANUP LEVELS AT SUPERFUND SITES.

POTENTIAL CONCERN FOR NONCARCINOGENIC EFFECTS OF A SINGLE CONTAMINANT IN A SINGLE MEDIUM IS EXPRESSED AS THE HAZARD QUOTIENT (HQ) (OR THE RATIO OF THE ESTIMATED INTAKE DERIVED FROM THE CONTAMINANT CONCENTRATION IN A GIVEN MEDIUM TO THE CONTAMINANT'S REFERENCE DOSE). BY ADDING THE HQS FOR ALL CONTAMINANTS WITHIN A MEDIUM OR ACROSS ALL MEDIA TO WHICH A GIVEN POPULATION MAY REASONABLY BE EXPOSED, THE HAZARD INDEX (HI) CAN BE GENERATED. THE HI PROVIDES A USEFUL REFERENCE POINT FOR GAUGING THE POTENTIAL SIGNIFICANCE OF MULTIPLE CONTAMINANT EXPOSURES WITHIN A SINGLE MEDIUM OR ACROSS MEDIA. A HI VALUE GREATER THAN 1.0 INDICATES THAT THE POTENTIAL EXISTS FOR ADVERSE HEALTH EFFECTS TO OCCUR FROM THE ASSUMED EXPOSURE PATHWAYS AND DURATIONS, AND THAT REMEDIAL ACTION MAY BE WARRANTED FOR THE SITE.

ALTHOUGH LECRS AND HIS WERE CALCULATED FOR BOTH CURRENT AND FUTURE LAND USE SCENARIOS AT THE SITE, IN THE INTEREST OF CONSERVATISM THE WORST CASE SCENARIOS ARE CARRIED THROUGH AS BEING REPRESENTATIVE OF THE RISKS POSED BY THE SITE. FUTURE LAND USE BY ON-SITE RESIDENTS WAS THE WORST CASE SCENARIO AT ALL OF THE AREAS. A PORTION OF THE FAIRWAY SIX AREA, BECAUSE IT IS PARTIALLY SITUATED ON A GOLF COURSE, WAS ALSO EVALUATED UNDER AN ON-SITE ADULT WORKER AS THE WORST CASE SCENARIO.

CONSIDERING THAT NO LONG TERM REMEDIAL ACTION TAKES PLACE AT THE SITE, THE POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS TO THE POPULATION UNDER CURRENT AND FUTURE LAND USE SCENARIOS ARE DISCUSSED BELOW.

#### 6.4.1 FARM CHEMICALS AREA

TABLES 15 AND 16 SUMMARIZE THE QUANTITATIVE ESTIMATES OF RISK UNDER THE CURRENT AND FUTURE LAND USE SCENARIO FOR EACH TARGET POPULATION AT THE FARM CHEMICALS AREA.

##### CURRENT RISK CHARACTERIZATION

THE TOTAL LECR FOR CURRENT ADULT RESIDENTS VIA ALL EXPOSURE PATHWAYS IS  $1 \times (10^{-3})$  WITH INGESTION OF SURFICIAL SOIL AS A SIGNIFICANT PATHWAY. WHILE THE CHRONIC AND SUBCHRONIC HIS ARE FAIRLY LOW FOR CURRENT ADULT RESIDENTS, THE SUBCHRONIC HI FOR A CURRENT CHILD RESIDENT IS 72.5. THE MAJOR CONTAMINANT CONTRIBUTORS ARE ARSENIC, COPPER, DDT, AND ALPHA-BHC.

##### FUTURE RISK CHARACTERIZATION

AT THE FARM CHEMICALS AREA THE TOTAL LECR FOR FUTURE ADULT ON-SITE RESIDENTS AND ON-SITE ADULT WORKERS VIA ALL EXPOSURE PATHWAYS ARE  $3 \times (10^{-3})$  AND  $2 \times (10^{-3})$  RESPECTIVELY. ALPHA-, BETA-, AND GAMMA-BHC ARE MAJOR CONTRIBUTORS TO THE TOTAL CARCINOGENIC RISK. INGESTION OF CONTAMINATED GROUNDWATER IS A MAJOR ROUTE OF EXPOSURE.

THE CHRONIC AND SUBCHRONIC HIS FOR FUTURE ADULT RESIDENTS WERE QUITE ELEVATED (44.9 AND 34.6, RESPECTIVELY), WHILE THE SUBCHRONIC HI FOR A FUTURE CHILD RESIDENT WAS EXTREMELY ELEVATED (171.7). INHALATION OF GROUNDWATER CONTRIBUTES ABOUT ONE HALF OF THE RISK FOR EACH TARGET POPULATION, WITH INGESTION OF GROUNDWATER AND SURFICIAL SOIL ALSO SIGNIFICANT EXPOSURE PATHWAYS. THE CONTAMINANTS WHICH ARE MAJOR CONTRIBUTORS TO THE HI ARE XYLENE, 4,4'-DDT, AND SEVERAL INORGANICS (ARSENIC, COPPER, AND MANGANESE).

#### 6.4.2 TWIN SITES AREA

TABLES 17 AND 18 SUMMARIZE THE QUANTITATIVE ESTIMATES OF RISK UNDER THE CURRENT AND FUTURE LAND

USE SCENARIO FOR EACH TARGET POPULATION AT THE TWIN SITES AREA.

#### CURRENT RISK CHARACTERIZATION

THE TOTAL LECR FOR CURRENT ADULT RESIDENTS NEAR THE AREA AND ADULT TRESPASSERS ARE  $1 \times (10^{-4})$  AND  $4 \times (10^{-5})$ , RESPECTIVELY. INGESTION OF SURFICIAL SOIL AND DERMAL CONTACT WITH SEDIMENT AND SURFICIAL SOIL ARE MAJOR ROUTES OF EXPOSURE. ALPHA-BHC, TOXAPHENE AND 4,4'-DDT ARE MAJOR CONTAMINANTS. EXCEPT FOR CURRENT CHILD RESIDENTS NEAR THE AREA, CHRONIC AND SUBCHRONIC HIS WERE LESS THAN 1.0. THE HI SUBCHRONIC FOR A CURRENT CHILD RESIDENT NEARBY WAS 2.0 WITH INGESTION OF FISH AS THE PRIMARY PATHWAY.

#### FUTURE RISK CHARACTERIZATION

AT THE TWIN SITES AREA THE TOTAL LECR FOR FUTURE ADULT ON-SITE RESIDENTS WAS  $2 \times (10^{-3})$ , WITH INGESTION OF GROUNDWATER AS THE PRIMARY SOURCE OF RISK. ALPHA-BHC, ALDRIN, AND BETA-BHC WERE THE CONTAMINANTS CONTRIBUTING MOST OF THE TOTAL CARCINOGENIC RISK. THE CARCINOGENIC RISK TO RECREATIONAL USERS WAS  $1 \times (10^{-4})$ .

THE CHRONIC AND SUBCHRONIC HIS FOR FUTURE ADULT RESIDENTS WERE ELEVATED (37.9 AND 36.9, RESPECTIVELY), WHILE THE SUBCHRONIC HI FOR A FUTURE CHILD RESIDENT WAS ALSO VERY ELEVATED (84.6). INGESTION OF GROUNDWATER CONTRIBUTES ABOUT 95 PERCENT OF THE RISK FOR EACH TARGET POPULATION. HI VALUES FOR INGESTION OF FISH FROM PAGES LAKE AND INHALATION OF GROUNDWATER EXCEED 1.0 FOR SUBCHRONIC RISK TO FUTURE ON-SITE CHILD RESIDENTS. THE CONTAMINANTS WHICH ARE MAJOR CONTRIBUTORS TO THE HI ARE ANTIMONY, ALDRIN AND XYLENE (AND 4,4'-DDT AND MERCURY FOR CHILDREN); ALTHOUGH THE UNCERTAINTY FACTOR ASSOCIATED WITH ANTIMONY IS HIGH BECAUSE IT WAS FOUND AT A TRACE LEVEL IN ONLY 1 OF 4 GROUNDWATER SAMPLES.

#### 6.4.3 FAIRWAY SIX AREA

TABLES 19 AND 20 SUMMARIZE THE QUANTITATIVE ESTIMATES OF RISK UNDER THE CURRENT AND FUTURE LAND USE SCENARIOS FOR EACH TARGET POPULATION AT THE FAIRWAY SIX AREA.

#### CURRENT RISK CHARACTERIZATION

THE TOTAL LECR FOR A CURRENT AND FUTURE ADULT WORKER WAS  $2 \times (10^{-5})$  WITH INGESTION OF SURFICIAL SOIL AND FISH AS MAJOR SOURCES OF RISK. ALPHA-BHC AND 4,4'-DDT WERE THE CONTAMINANTS CONTRIBUTING MOST OF THE TOTAL CARCINOGENIC RISK. TOTAL CARCINOGENIC RISK TO AN ADULT WORKER AND ADULT GOLFER WERE  $2 \times (10^{-5})$  AND  $2 \times (10^{-6})$ , RESPECTIVELY. THE SUBCHRONIC AND CHRONIC HIS FOR ALL TARGET POPULATIONS WERE INSIGNIFICANT (UP TO 0.63). INGESTION OF FISH BY AN ADULT WORKER WAS THE MAJOR PATHWAY FOR THE CHRONIC HI (0.57).

#### FUTURE RISK CHARACTERIZATION

UNDER FUTURE LAND USES FOR THE FAIRWAY SIX AREA, MOST EXPOSURE CONDITIONS ARE THE SAME AS CURRENT LAND USE. THEREFORE, THE CARCINOGENIC AND NON-CARCINOGENIC RISKS ARE IDENTICAL. A PORTION OF THE AREA, HOWEVER, IS LOCATED ON PRIVATE PROPERTY AND IS EXPECTED TO UNDERGO RESIDENTIAL DEVELOPMENT. THE FUTURE LECR TO AN ON-SITE ADULT AND CHILD RESIDENT IS  $1.1 \times (10^{-3})$  AND  $2.4 \times (10^{-3})$ , RESPECTIVELY. INHALATION OF DUST AND DERMAL CONTACT WITH GROUNDWATER WERE THE PRIMARY ROUTES OF EXPOSURE. ALPHA-BHC, BETA-BHC, 4,4'-DDT AND ALDRIN ARE THE MAJOR CONTAMINANT CONTRIBUTORS. THE NON-CARCINOGENIC ASSESSMENT FOR FUTURE ON-SITE RESIDENTS WERE LESS THAN ONE. A HOT SPOT AREA LOCATED ON THE GOLF COURSE WAS EVALUATED FOR CARCINOGENIC RISKS. THE FUTURE LECR TO AN ADULT WORKER WAS  $8.03 \times (10^{-5})$  WITH INGESTION OF AND DERMAL CONTACT WITH SURFICIAL SOIL THE PRIMARY ROUTES OF EXPOSURE. 4,4'-DDT IS THE MAJOR CONTAMINANT CONTRIBUTOR.

#### 6.4.4 MCIVER DUMP AREA

TABLES 21 AND 22 SUMMARIZE THE QUANTITATIVE ESTIMATES OF RISK UNDER THE CURRENT AND FUTURE LAND USE SCENARIOS FOR EACH TARGET POPULATION AT THE MCIVER DUMP AREA.

#### CURRENT RISK CHARACTERIZATION

THE TOTAL LECR FOR CURRENT ADULT TRESPASSERS AT THE MCIVER DUMP AREA IS  $3 \times (10^{-5})$ . INGESTION OF AND DERMAL CONTACT WITH SURFICIAL SOIL ARE THE MAJOR SOURCES OF RISK WITH ALPHA-BHC AS THE PRIMARY CONTAMINANT CONTRIBUTOR. THE CHRONIC AND SUBCHRONIC HIS WERE INSIGNIFICANT FOR ALL CURRENT TARGET POPULATIONS.

#### FUTURE RISK CHARACTERIZATION

THE TOTAL LECR FOR FUTURE ADULT RESIDENTS WAS  $3 \times (10^{-4})$ , WITH INGESTION OF AND DERMAL CONTACT WITH SURFICIAL SOIL DRIVING THE RISK. ALPHA-BHC CONTRIBUTED MOST OF THE CARCINOGENIC RISK, WITH 4,4'-DDT, BETA-BHC, AND TOXAPHENE ALSO CONTRIBUTING SIGNIFICANTLY.

THE CHRONIC AND SUBCHRONIC HIS FOR FUTURE ADULT RESIDENTS WERE LESS THAN 1.0 (0.5 AND 0.46, RESPECTIVELY), WHILE THE SUBCHRONIC HI FOR A FUTURE CHILD RESIDENT WAS SLIGHTLY ELEVATED (2.28). INGESTION OF FISH FROM PAGES LAKE CONTRIBUTED 50 PERCENT TO THE OVERALL RISK (BECAUSE ALL THE AREAS ARE REASONABLY CLOSE TO PAGES LAKE, RECREATIONAL USE OF THIS LAKE WAS INCLUDED IN THE RISK ASSESSMENT FOR EACH AREA). DERMAL CONTACT WITH SEDIMENT ALSO CONTRIBUTED TO THE OVERALL RISK. THE CONTAMINANTS WHICH ARE MAJOR CONTRIBUTORS TO THE HI ARE 4,4'-DDT (SEDIMENT) AND MERCURY (FISH IN PAGES LAKE).

#### 6.4.5 ROUTE 211 AREA

TABLES 23 AND 24 SUMMARIZE THE QUANTITATIVE ESTIMATES OF RISK UNDER THE CURRENT AND FUTURE LAND USE SCENARIO FOR EACH TARGET POPULATION AT THE ROUTE 211 AREA.

#### CURRENT RISK CHARACTERIZATION

AT THE ROUTE 211 AREA THE TOTAL LECR FOR CURRENT ADULT SITE TRESPASSERS IS  $2 \times (10^{-4})$  WITH INGESTION OF AND DERMAL CONTACT WITH SURFICIAL SOIL AS THE PRIMARY ROUTES OF EXPOSURE. 4,4'-DDT, TOXAPHENE AND ALPHA-BHC ARE MAJOR CONTRIBUTORS TO THE CURRENT ADULT TRESPASSER LECR.

THE CHRONIC AND SUBCHRONIC HI VALUES FOR CURRENT ADULT TRESPASSERS WAS INSIGNIFICANT (1.3 AND 1.28, RESPECTIVELY). THE SUBCHRONIC HI FOR A CURRENT CHILD TRESPASSER WAS SLIGHTLY ELEVATED AT 14.9 WITH INGESTION OF AND DERMAL CONTACT WITH SURFICIAL SOIL THE PRIMARY ROUTES OF EXPOSURE.

#### FUTURE RISK CHARACTERIZATION

AT THE ROUTE 211 AREA THE TOTAL LECR FOR FUTURE ADULT RESIDENTS WAS  $2 \times (10^{-3})$ , WITH SURFICIAL SOIL BEING THE MAJOR CONTRIBUTOR. ALPHA-BHC AND TOXAPHENE PROVIDED MUCH OF THE TOTAL CARCINOGENIC RISK VIA THE ORAL AND DERMAL PATHWAYS.

THE CHRONIC AND SUBCHRONIC HIS FOR ADULTS WERE ELEVATED (13.4 AND 13.2, RESPECTIVELY), WHILE THE SUBCHRONIC HI FOR CHILDREN WAS EXTREMELY ELEVATED (124.2). INGESTION OF AND DERMAL CONTACT WITH SURFICIAL SOIL CONTRIBUTE AT LEAST 95 PERCENT OF THE RISK FOR EACH TARGET POPULATION. IN EACH CASE, MERCURY CONTRIBUTED ABOUT 90 PERCENT OF THIS RISK. HOWEVER, THE UNCERTAINTY IS HIGH BECAUSE IT WAS DETECTED AT A VERY ELEVATED LEVEL (4,800 MG/KG) IN THE ONLY SURFICIAL SOIL SAMPLE THAT WAS ANALYZED FOR INORGANICS AT THE ROUTE 211 AREA. ADDITIONAL SAMPLING MUST BE CONDUCTED TO DETERMINE IF THIS CONCENTRATION OF MERCURY IS REPRESENTATIVE OF SURFICIAL SOILS AT THE AREA, OR IF IT IS AN ISOLATED "HOT SPOT" (IN WHICH CASE THE RISK MAY BE OVERESTIMATED).

#### 6.4.6 RISK CHARACTERIZATION UNCERTAINTIES

METHODS IN EPA'S SUPERFUND RISK ASSESSMENT GUIDANCE (USEPA, 1989A) ARE USED TO CHARACTERIZE SITE RISKS. A CONSERVATIVE APPROACH (REASONABLE MAXIMUM EXPOSURE (RME)) WAS USED. THIS RME APPROACH OR SCENARIO LEADS TO CONSERVATIVE ESTIMATES OF BOTH CHRONIC AND SUBCHRONIC DAILY INTAKE OF SITE-RELATED CONTAMINANTS; AND THUS THE POTENTIAL RISK ESTIMATES. NEVERTHELESS, QUANTITATIVE RISK ESTIMATE UNCERTAINTIES MAY BE ASSOCIATED WITH DAILY INTAKE FACTORS, TOXICITY CRITERIA, OTHER FACTORS, OR THE COWHERD AIR PARTICULATES MODELING. TABLE 25 SUMMARIZES THE UNCERTAINTIES ASSOCIATED WITH QUANTITATIVE RISK ESTIMATES.

THREE AIR SAMPLES WERE TAKEN, ONE EACH FOR THE FARM CHEMICALS, TWIN, AND FAIRWAY SIX AREAS, AND

ANALYZED FOR PESTICIDES ONLY. AS DISCUSSED, THE COWHERD MODEL WAS USED TO ESTIMATE THE CONTAMINANT CONCENTRATIONS IN AIR BECAUSE OF THE LACK OF OR INCONSISTENCIES IN DATA ON INORGANICS AND ORGANICS. HOWEVER, A QUANTITATIVE RISK UNCERTAINTY ANALYSIS WAS PERFORMED TO DETERMINE THE DIFFERENCE BETWEEN THE CONTAMINANT CONCENTRATION ESTIMATED USING THE COWHERD MODEL AND THOSE ACTUALLY MEASURED AT THE SITE. SINCE INHALATION RFDS FOR BOTH CHRONIC AND SUBCHRONIC EFFECTS ARE NOT AVAILABLE FOR ALL PESTICIDES, ONLY THE CARCINOGENIC RISK IS ANALYZED IN THIS SUBSECTION.

WITH THE EXCEPTION OF BETA-BHC AND GAMMA-BHC AT THE FARM CHEMICALS AREA, THE COWHERD ESTIMATED VALUES WERE IN GENERAL, TWO ORDERS OF MAGNITUDES LESS THAN THE ACTUAL MEASUREMENTS. THUS, THE COWHERD ESTIMATED RISK VIA INHALATION OF SURFICIAL SOIL COULD BE UNDERESTIMATED BY TWO ORDERS OF MAGNITUDE.

#### FARM CHEMICALS AREA

THE LECR FOR PESTICIDES RANGES FROM  $3 \times (10^{-7})$  TO  $3 \times (10^{-10})$  (THE TOTAL LECR IS  $1 \times (10^{-4})$ ). WHEN THREE ORDERS OF MAGNITUDE ARE APPLIED TO THE LECR FOR EACH PESTICIDE, THE TOTAL LECR IS APPROXIMATELY  $1 \times (10^{-3})$ . THUS, THE UNCERTAINTY FOR RISK VIA INHALATION OF SURFICIAL SOIL AT THE FARM CHEMICALS AREA IS ONE ORDER OF MAGNITUDE.

#### TWIN SITES AREA

THE LECR FOR PESTICIDES RANGES FOR  $4 \times (10^{-8})$  TO  $8 \times (10^{-12})$  (THE TOTAL LECR IS  $1 \times (10^{-7})$ ). WHEN THREE ORDERS OF MAGNITUDE ARE APPLIED TO THE LECR FOR EACH PESTICIDE, THE TOTAL LECR IS APPROXIMATELY  $5 \times (10^{-5})$ . THUS, THE UNCERTAINTY FOR RISK VIA INHALATION OF SURFICIAL SOIL AT THE TWIN SITES AREA IS TWO ORDERS OF MAGNITUDE.

#### FAIRWAY SIX AREA

THE LECR FOR PESTICIDES RANGES FROM  $4 \times (10^{-9})$  TO  $4 \times (10^{-11})$  (THE TOTAL LECR IS  $5 \times (10^{-7})$ ). WHEN THREE ORDERS OF MAGNITUDE ARE APPLIED TO THE LECR FOR EACH PESTICIDE, THE TOTAL LECR IS APPROXIMATELY  $9 \times (10^{-6})$ . THUS, THE UNCERTAINTY FOR RISK VIA INHALATION OF SURFICIAL SOIL AT FAIRWAY SIX AREA IS ONE ORDER OF MAGNITUDE.

#### 6.5 ADDENDUM TO THE RISK ASSESSMENT AT THE FARM CHEMICALS AREA

CONTAMINANTS IDENTIFIED DURING EPA'S JULY AND NOVEMBER 1990 SAMPLING EVENTS WERE EVALUATED TO DETERMINE IF ANY RISK MAY BE POSED TO HUMAN HEALTH AND THE ENVIRONMENT. THE CONTAMINANTS OF CONCERN AND EXPOSURE CONCENTRATIONS AT THE FARM CHEMICALS AREA ARE:

CHEMICAL	SURFICIAL SOIL EXPOSURE CONCENTRATION (UG/KG)	GROUNDWATER EXPOSURE CONCENTRATIONS (UG/L)
TOXAPHENE	19,731,853	19
DBCP	29	140
CARBON DISULFIDE	34	51
SEVIN	70,598	0.045
2,4-D	3,293	
MALATHION	224	
4,4'-DDT	150	
2,4'-DDT	37	
CHLORDANE (TOTAL)	10	
DIELDRIN	32	
DISYSTON		0.26

ONLY RISK FROM THE WORST CASE SCENARIO, FUTURE ON-SITE RESIDENTS WAS ESTIMATED BASED ON THE ADDITIONAL DATA FOR SOIL. THE EXPOSURE PATHWAYS THE ON-SITE RESIDENTS MAY BE EXPOSED TO CONTAMINANTS AT THE FARM CHEMICALS AREA ARE THROUGH:

- DERMAL CONTACT WITH OR INGESTION OF SURFACE SOILS AND EXPOSED WASTES;
- INHALATION OF SUSPENDED PARTICULATES GENERATED FROM CONTAMINATED SOIL AND EXPOSED WASTES; AND
- INHALATION DURING SHOWERING WITH, DERMAL CONTACT WITH, AND INGESTION OF CONTAMINATED GROUNDWATER.

TOXICOLOGICAL PROPERTIES OF THE ADDITIONAL CONTAMINANTS OF CONCERN ARE BRIEFLY SUMMARIZED BELOW.

		CARCINOGENIC	
		CARCINOGENIC WEIGHT OF EVIDENCE	SLOPE FACTOR (MG/KG/DAY)
			ORAL      INHALATION
2,4-D			
1.2-DIBROMOETHANE	B2		8.5E+1      7.6E-1
DYSISTON			---      ---
MALATHION			---      ---
SEVIN (CARBARYL)			---      ---
DBCP	B2		22E-1      22E-1

		NONCARCINOGENIC	
		CHRONIC (RFD) (MG/KG/DAY) (ORAL)	SUBCHRONIC (RFD) (MG/KG/DAY) (ORAL)
			UNCERTAINTY FACTOR
2,4-D	1E-2	1E-2	100
1.2-DIBROMOETHANE			
DYSISTON	4E-5	4E-5	100
MALATHION		2E-2	2E-2 10
SEVIN (CARBARYL)	1E-1	1E-1	100
DBCP			

THE NEWLY IDENTIFIED CONTAMINANTS AT THE FARM CHEMICALS AREA ARE DBCP, SEVIN, 2,4-D, MALATHION, AND DISYSTON. DBCP IS THE ONLY ONE FOR WHICH EXISTING TOXICOLOGICAL DATA ON CARCINOGENIC EFFECTS ARE AVAILABLE, WHILE DATA ON NONCARCINOGENIC EFFECTS ARE AVAILABLE FOR THE REMAINING CONTAMINANTS. TOXAPHENE AND 1,2-DICHLOROETHANE WERE THE PREVIOUSLY IDENTIFIED CONTAMINANTS THAT WERE DETECTED AT A HIGHER CONCENTRATIONS IN THIS INVESTIGATION. THE RISKS FOR THESE CONTAMINANTS AT THE FARM CHEMICALS AREA ARE SUMMARIZED BELOW.

THE LECRS CONTRIBUTED BY THE CONTAMINANTS FOR EACH PATHWAY ARE:

CONTAMINANT	ORAL		DERMAL		INHALATION		LECR TOTAL
	SS	GW	SS	GW	SS	GW	
DBCP	2X10-7	4X10-2	1X10-6	2X10-2	2X10-8	1X10-2	7.3X10-2
TOXAPHENE	6X10-3	2X10-4	7X10-3	3X10-7	7X10-4	2X10-5	1.5X10-2
1,2-DICHLOROETHANE	NA	6X10-5	NA	1X10-7	NA	9X10-5	1.4X10-4
							8.8X10-2

ALTHOUGH TOXAPHENE WAS PREVIOUSLY IDENTIFIED IN THE RI AS A CONTAMINANT OF CONCERN WITH A LECR OF  $2 \times (10^{-4})$ , THE CALCULATED LECR BASED ON THE ADDITIONAL DATA IS APPROXIMATELY 75 TIMES HIGHER THAN THE VALUE REPORTED IN THE RI. THUS, THE RISK ASSOCIATED WITH TOXAPHENE AT THE FARM CHEMICALS AREA THAT WAS REPORTED IN THE RI COULD BE UNDERESTIMATED. THE LECR FOR 1,2-DICHLOROETHANE IS ESTIMATED TO BE  $1.4 \times (10^{-4})$ , WHICH IS SLIGHTLY HIGHER THAN THE LECR

REPORTED IN THE RI 6 X (10-5).

THE LECR POSED BY THE NEWLY IDENTIFIED CONTAMINANT DBCP 7 X (10-2) IS MAINLY DUE TO EXPOSURE TO GROUNDWATER (APPROXIMATELY 30 PERCENT OF TOTAL RISK), VIA THE ORAL, DERMAL, AND INHALATION ROUTES. THE TOTAL LECR FROM THE THREE PATHWAYS REPORTED IN THE RI WAS 3 X (10-3). WITH THIS NEW FINDING, THE CARCINOGENIC RISK AT THE FARM CHEMICALS AREA COULD BE SIGNIFICANTLY UNDERESTIMATED. HOWEVER, THE UNCERTAINTY ASSOCIATED WITH DBCP IS EXPECTED TO BE HIGH BECAUSE ONLY TWO GROUNDWATER SAMPLES WERE TAKEN AND THE MAXIMUM DETECTED CONCENTRATION IS USED IN THE QUANTITATIVE RISK CALCULATION.

EFFECTS OF EXPOSURE TO NONCARCINOGENS ARE ESTIMATED BY CALCULATING THE HAZARD INDEX (HI). BOTH CHRONIC EXPOSURE (30 YEARS) AND SUBCHRONIC EXPOSURE (5 YEARS) ARE EVALUATED. THE TOTAL CHRONIC AND SUBCHRONIC HIS FOR FUTURE ADULT RESIDENTS AT THE FARM CHEMICALS AREA IS 0.19. INGESTION OF GROUNDWATER IS THE PRIMARY ROUTE OF EXPOSURE. DISYSTON IS THE MAJOR CONTAMINANT CONTRIBUTOR (0.19) TO THE CHRONIC AND SUBCHRONIC HI VALUES.

THE TOTAL SUBCHRONIC HI FOR FUTURE CHILD ON-SITE RESIDENTS AT THE FARM CHEMICALS AREA IS 0.44. INGESTION OF CONTAMINATED GROUNDWATER IS THE PRIMARY ROUTE OF EXPOSURE. DISYSTON IS THE MAJOR CONTAMINANT CONTRIBUTOR (0.41)

#DA

## 7.0 DESCRIPTION OF ALTERNATIVES

THE GOAL OF REMEDIAL ACTION AT THE ABERDEEN PESTICIDE DUMPS SITE IS TO PREVENT, REDUCE OR MITIGATE AND MINIMIZE POTENTIAL OR CURRENT RISKS TO PUBLIC HEALTH, WELFARE, AND THE ENVIRONMENT POSED BY CONTAMINANTS AT THE SITE. TECHNICALLY APPLICABLE TECHNOLOGIES THAT WERE JUDGED TO BE POTENTIALLY VIABLE TO MEET THE CLEANUP OBJECTIVES FOR THE SITE WERE IDENTIFIED, SCREENED, AND ASSESSED. THESE TECHNOLOGIES WERE FURTHER EVALUATED AND SCREENED AS TO THEIR EFFECTIVENESS, IMPLEMENTABILITY, AND RELATIVE COST IN COMPARISON WITH OTHER TECHNOLOGIES THAT ACCOMPLISH THE SAME OBJECTIVE FOR THE SAME MEDIA. TECHNOLOGIES SURVIVING THE INITIAL SCREENING WERE DEVELOPED AND SCREENED FURTHER TO ELIMINATE THOSE TECHNOLOGIES THAT HAVE ADVERSE IMPACT ON HUMAN HEALTH AND THE ENVIRONMENT, ARE NOT APPLICABLE TO THE CONTAMINANT AND MEDIA AT THE SITE, OR ARE MUCH MORE EXPENSIVE TO IMPLEMENT THAN OTHER ALTERNATIVES THAT PROVIDE ESSENTIALLY THE SAME LEVEL OF PROTECTION.

TWO COST ESTIMATES WERE CALCULATED IN THE FEASIBILITY STUDY AND ARE PROVIDED IN THE DESCRIPTION OF ALTERNATIVES BELOW. THE FIRST COST DISCUSSED REPRESENTS A TOTAL COST ESTIMATE IF THE SELECTED REMEDY WERE IMPLEMENTED AT ONE CENTRAL LOCATION. PRESENT WORTH (BASE) COST ESTIMATES AT EACH AREA ARE ALSO PROVIDED. ALL COST DISCUSSED ARE THE BASE COST ESTIMATE. ONE OF THE REASONS FOR PRESENTING COST INFORMATION IN THIS FORMAT IS TO ILLUSTRATE THAT A COORDINATED RESPONSE ACTION IS MORE COST EFFECTIVE THAN INDEPENDENTLY RESPONDING TO EACH AREA.

SEVEN REMEDIAL ALTERNATIVES WERE DEVELOPED FOR THE CONTAMINATED SOILS WHICH FOCUS ON REDUCING HUMAN EXPOSURE TO CONTAMINATED SOIL AS WELL AS PREVENTING FURTHER MIGRATION TO OTHER MEDIA. A COMPREHENSIVE DESCRIPTION OF EACH ALTERNATIVE EVALUATED IS PROVIDED BELOW.

### ALTERNATIVE 1: NO ACTION

THE NO ACTION ALTERNATIVE SERVES AS A BASELINE WHICH OTHER REMEDIAL TECHNOLOGIES CAN BE MEASURED AND IS RETAINED FOR A COMPARATIVE ANALYSIS AS REQUIRED BY THE NCP. UNDER THE NO ACTION ALTERNATIVE THE SITE IS LEFT "AS IS" AND NO ACTIONS ARE TAKEN TO CONTROL OR CLEAN-UP THE CONTAMINATION. THIS ALTERNATIVE DOES NOT REDUCE THE POTENTIAL FOR CONTAMINANT MIGRATION FROM THE SITE NOR DOES IT MINIMIZE OR ELIMINATE THE POTENTIAL EXPOSURE TO THE ON-SITE CONTAMINANTS OR THOSE THAT HAVE MIGRATED OFF-SITE. THE NO ACTION ALTERNATIVE DOES NOT MEET THE REMEDIAL OBJECTIVES OF THE FS, THE NCP, AND CERCLA.

### ALTERNATIVE 2: ENVIRONMENTAL MONITORING/INSTITUTIONAL CONTROLS/FENCING

THE ENVIRONMENTAL MONITORING ALTERNATIVE IS A LIMITED ACTION TAKEN TO BETTER DEFINE THE EXTENT OF CONTAMINATION AND LIMIT PUBLIC EXPOSURE TO CONTAMINATED MEDIA.

THE ENVIRONMENTAL MONITORING ALTERNATIVE CALLS FOR THE INSTALLATION OF ADDITIONAL MONITORING WELLS TO BETTER DEFINE THE EXTENT OF THE CONTAMINATION IN THE GROUNDWATER BY IDENTIFYING THE BOUNDARIES OF THE CONTAMINATED PLUMES AND UTILIZING INSTITUTIONAL CONTROLS (FENCING AND SIGNS) TO REDUCE PUBLIC CONTACT WITH CONTAMINATED MEDIA.

ON-SITE AREAS OF SOIL CONTAMINATION WILL BE FENCED AND POSTED, WHILE CONTAMINATED GROUNDWATER DISCHARGE AREAS OFF-SITE WILL ONLY BE POSTED. NO EFFORT WILL BE MADE TO MITIGATE THE MIGRATION OF CONTAMINANTS; THUS CONTINUED ENVIRONMENTAL DAMAGE WILL OCCUR VIA SURFACE WATER RUNOFF (SEDIMENT TRANSPORT) AND GROUNDWATER MIGRATION. FURTHER BIOACCUMULATION OF SITE CONTAMINANTS WILL CONTINUE. ENVIRONMENTAL MONITORING WILL CONSIST OF COLLECTING SOIL AND GROUNDWATER SAMPLES ANNUALLY, CONDUCTING LABORATORY ANALYSIS OF THESE SAMPLES, CONSOLIDATING THE LABORATORY DATA, INSPECTING FENCES AND POSTED WARNING SIGNS, AND PREPARING AN ANNUAL SUMMARY REPORT WHICH INCLUDES A COMPARISON WITH PREVIOUSLY COLLECTED DATA AND IDENTIFICATION OF NEW AREAS OF CONCERN DUE TO CONTAMINANT MIGRATION.

TWELVE 4-INCH STAINLESS STEEL MONITORING WELLS, AVERAGING 40 FEET IN DEPTH, WILL HAVE TO BE INSTALLED TO BETTER DEFINE THE EXTENT OF GROUNDWATER CONTAMINATION. THE NUMBER OF MONITORING WELLS BE INSTALLED AT EACH AREA ARE LISTED BELOW. MONITORING WELL LOCATIONS ARE IDENTIFIED IN SECTION 4 OF THE FS.

AREA	NUMBER OF WELLS
FARM CHEMICALS	5
TWIN SITES	3
FAIRWAY SIX	2
MCIVER DUMP	1
ROUTE 211	1

BECAUSE THIS ALTERNATIVE WOULD RESULT IN CONTAMINANTS REMAINING ON-SITE, CERCLA REQUIRES THAT THE SITE BE REVIEWED EVERY FIVE YEARS. IF JUSTIFIED BY THE REVIEW, REMEDIAL ACTIONS WOULD BE IMPLEMENTED AT THAT TIME TO REMOVE OR TREAT THE WASTES.

THIS ALTERNATIVE WOULD ONLY TAKE A FEW WEEKS TO IMPLEMENT AT A CAPITAL BASE COST OF \$650,000. CAPITAL COST INCLUDES CONSTRUCTION OF THE MONITORING WELLS AND FENCES, SAMPLING AND ANALYSIS, REPORT PREPARATION, MOBILIZATION AND DEMOBILIZATION. OPERATION AND MAINTENANCE COST ARE ESTIMATED AT \$72,000. ESTIMATED BASE PRESENT WORTH IS \$1,777,000. PRESENT WORTH COST SUMMARY BY AREA IS:

AREA	PRESENT WORTH BASE
FARM CHEMICALS	\$515,000
TWIN SITES	\$584,000
FAIRWAY SIX	\$562,000
MCIVER DUMP	\$409,000
ROUTE 211	\$412,000
TOTAL	\$2,482,000

#### ALTERNATIVE 3: MULTIMEDIA CAP (ALTERNATIVE 3 - OPTION B IN FS)

MULTIMEDIA CAPPING IS A METHOD OF SOURCE CONTROL CONTAINMENT TO PREVENT THE CONTINUED CONTAMINATION OF GROUNDWATER AND DIRECT EXPOSURE TO HUMANS.

UNDER THIS ALTERNATIVE, AN IMPERMEABLE/LOW PERMEABLE CAP WOULD BE CONSTRUCTED OVER THE CONTAMINATED WASTES/SOILS, SURFACE RUNOFF WOULD BE DIVERTED BY REGRADING, AND SITE ACCESS WOULD BE RESTRICTED BY FENCING CONTAMINATED AREAS. ENVIRONMENTAL MONITORING WOULD CONFIRM WHETHER CONTAMINANTS ARE MIGRATING OFF-SITE, WHILE PERIODIC INSPECTION AND REPAIRS OF THE CAP WILL BE REQUIRED.



THE MULTIMEDIA CAP WILL CONSIST FROM BOTTOM TO TOP, OF THE FOLLOWING LAYERS: COMPACTED NATIVE SOIL USED TO LEVEL THE AREA, COMPACTED CLAY, A SYNTHETIC MEMBRANE, GRANULAR DRAINAGE, A FILTER FABRIC, COMPACTED NATIVE SOIL, AND A TOPSOIL LAYER TO SUPPORT VEGETATION.

IMPLEMENTATION OF THIS ALTERNATIVE DOES NOT PROVIDE COMPLIANCE WITH CURRENT ARARS SINCE NO REMEDIAL MEASURES ARE UNDERTAKEN AND CURRENT CONDITIONS EXCEED FEDERAL AND STATE ARARS.

THE APPROXIMATE AREA, IN ACREAGE, COVERED BY THE CAP AT EACH AREA IS:

AREA	ACRES
FARM CHEMICALS	5
TWIN SITES	4
FAIRWAY SIX	4
MCIVER DUMP	1
ROUTE 211	1

ON EACH OF THE AREAS, SURFACE WATER WILL BE DIVERTED AWAY FROM THE CAP TO PREVENT ITS EROSION AND POSSIBLE EXPOSURE OF THE CONTAMINATED SOILS. EACH ENTIRE AREA WILL BE FENCED AND POSTED TO FURTHER PREVENT HUMAN CONTACT WITH HIGHLY CONTAMINATED SOILS, AND TO REDUCE POTENTIAL VANDALISM. THE CAPPED AREAS WILL BE HYDRO-SEEDED TO HELP PREVENT EROSION.

IN AREAS WHERE THE GROUNDWATER IS CLOSE TO OR WITHIN THE CONTAMINATED MATERIAL EITHER THE WATER TABLE WOULD HAVE TO BE LOWERED VIA EXTRACTION WELLS, OR SUBSURFACE DRAINS OR THE CONTAMINATED MATERIAL HAS TO BE EXCAVATED AND MOVED TO A HIGHER ELEVATION PRIOR TO CAPPING. LOWERING THE WATER TABLE WOULD REQUIRE TREATMENT AND DISPOSAL OF CONTAMINATED WATER. HOWEVER, MOVING OR CONSOLIDATING CONTAMINATED MATERIAL WITHIN EACH AREA OF CONTAMINATION WOULD NOT CONSTITUTE DISPOSAL/PLACEMENT UNDER RCRA.

THE PROPOSED CAP AT THE FARM CHEMICALS AREA ENCOMPASSES ALMOST THE ENTIRE AREA. THE ON-SITE BUILDINGS PROBABLY WOULD HAVE TO BE DEMOLISHED PRIOR TO CONSTRUCTION OF THE CAP. SWAB SAMPLES FROM THE BUILDING MATERIAL MUST BE COLLECTED AND TESTED FOR RCRA HAZARDOUS CHARACTERISTICS. IF IT IS FOUND TO BE HAZARDOUS THE MATERIAL MUST BE DECONTAMINATED PRIOR TO DISPOSAL. THIS CAN BE ACCOMPLISHED BY USING A HIGH PRESSURE STEAM CLEANER, SOLVENTS, OR SCABBLING (I.E., STRIPPING THE TOP LAYER OF CONCRETE). IT IS ASSUMED THAT THE BUILDING DEBRIS WILL BE DISPOSED OF IN THE LOCAL MUNICIPAL LANDFILL.

CONSTRUCTION OF THE CAP AT THE FIVE AREAS IS ESTIMATED TO TAKE LESS THAN ONE YEAR AT AN ESTIMATED CAPITAL COST OF \$6,537,000. LONG-TERM OPERATION AND MAINTENANCE IS ESTIMATED AT \$185,000. PRESENT WORTH COST IS \$9,848,000. SHOULD CAPPING OF THE AREAS BE FINANCED AND IMPLEMENTED BY DIFFERENT PAYING PARTIES, THE ESTIMATED PRESENT WORTH COST BY AREA IS PRESENTED BELOW.

AREA	PRESENT WORTH BASE
FARM CHEMICALS	\$3,844,000
TWIN SITES	\$2,715,000
FAIRWAY SIX	\$2,674,000
MCIVER DUMP	\$1,176,000
ROUTE 211	\$1,154,000
TOTAL	\$11,563,000

ALTERNATIVE 4: ON-SITE INCINERATION (ALTERNATIVE 5 IN FS)

INCINERATION IS A THERMAL TREATMENT TECHNOLOGY WHICH UTILIZES ELEVATED TEMPERATURES TO DESTROY OR DETOXYFY HAZARDOUS WASTE. UNDER THIS ALTERNATIVE, CONTAMINATED SOIL AND DEBRIS WOULD BE INCINERATED ON-SITE. RESIDUAL ASH FROM THE INCINERATOR WOULD BE BURIED ON-SITE IN A SOLID WASTE LANDFILL AND COVERED WITH CLEAN FILL AFTER VERIFICATION TESTING TO ENSURE THE ASH IS NON-HAZARDOUS. USE OF A MOBILE ROTARY KILN INCINERATOR WAS ASSUMED FOR COST ESTIMATION, DUE TO

THEIR RELATIVE ABUNDANCE AND AVAILABILITY. HOWEVER, OTHER TYPES OF INCINERATORS THAT PROVIDE EQUAL OR BETTER PERFORMANCE SHOULD BE CONSIDERED WHEN BIDDING THE PROJECT. INCINERATION IS THE BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT) FOR HALOGENATED ORGANIC COMPOUNDS, WHICH INCLUDES MOST OF THE PESTICIDES FOUND AT THE SITE. THIS ALTERNATIVE CONSISTS OF THE FOLLOWING REMEDIAL ACTIVITIES:

- MOBILIZING THE INCINERATOR IN A CENTRALIZED LOCATION;
- EXCAVATING PESTICIDE CONTAMINATED MATERIAL;
- TRANSPORTING THE MATERIAL TO THE CENTRALIZED LOCATION;
- HOMOGENIZING AND SIZING THE MATERIAL FOR INCINERATION;
- INCINERATING THE WASTE;
- ON-SITE TREATMENT OF PROCESS WASTEWATER OR SCRUBBER BLOWDOWN SLUDGE BY REINJECTION INTO THE INCINERATOR; AND
- SAMPLE AND ANALYSIS OF THE TREATMENT RESIDUE
- ON-SITE SOLID WASTE DISPOSAL OF NON-HAZARDOUS INCINERATOR ASH.

INCINERATION DESTROYS OR DETOXIFIES ORGANIC CONTAMINANTS AND GENERALLY CONVERTS THEM TO CO<sub>2</sub> H<sub>2</sub>O VAPOR, SO<sub>2</sub> AND NO<sub>x</sub> OFF-GASES AND ASH. SINCE MANY OF THE CONTAMINANTS ARE CHLORINATED, HYDROCHLORIC ACID (HCl) WILL BE GENERATED AS AN OFF-GAS AND MUST BE REMOVED WITH AN ACID GAS SCRUBBER BEFORE DISCHARGE TO THE ATMOSPHERE.

PRIOR TO INCINERATION, THE MATERIAL WILL BE PASSED THROUGH A SHREDDER AND POWER-SCREENS FOR SIZING. THE PROPERLY SIZED CONTAMINATED MATERIAL WILL THEN BE FED INTO THE INCINERATION UNIT. IN ORDER TO MAINTAIN A READILY AVAILABLE FEED FOR THE INCINERATOR A "WASTE PILE" MUST BE MAINTAINED ON-SITE. THIS WASTE PILE WILL CONSTITUTE PLACEMENT OF HAZARDOUS WASTE UNDER RCRA. THEREFORE, IT MUST COMPLY WITH RCRA REGULATIONS AS SPECIFIED IN CFR 265 SUBPARTS I AND L, USE AND MANAGEMENT OF CONTAINERS AND WASTE PILES, RESPECTIVELY. HOWEVER, BECAUSE THIS IS CONSIDERED AN "ON-SITE" CERCLA RESPONSE ACTION, NO STATE, LOCAL, OR FEDERAL PERMITS ARE NECESSARY. OPERATION OF THE INCINERATION UNIT WILL BE IN COMPLIANCE WITH RCRA REGULATIONS (PARTICULARLY SUBPART O, 40 CFR 264), INCLUDING PERFORMANCE STANDARDS. THE INCINERATOR AND AIR POLLUTION CONTROL UNIT WILL BE OPERATED SO THAT:

- AN OPERATING TEMPERATURE IN THE KILN OF 1,800°F IS MAINTAINED AT ALL TIMES TO ENSURE THAT ANY VOLATILE AND SEMI-VOLATILE ORGANIC CONSTITUENTS IN THE WASTE STREAM ARE DRIVEN OUT OF THE ASH AND THAT THE FIXED CARBON REMAINING IN THE ASH IS MINIMIZED;
- AN OPERATING TEMPERATURE IN THE AFTERBURNER OF 2,000 DEGREES F IS MAINTAINED AT ALL TIMES TO OXIDIZE AND DESTROY ALL REMAINING ORGANIC SUBSTANCES PRIOR TO EXITING THE AFTERBURNER AND ENTERING THE POLLUTION CONTROL SYSTEM;
- THE INCINERATOR MUST ACHIEVE A DESTRUCTION AND REMOVAL EFFICIENCY (DRE) OF 99.99 PERCENT FOR ALL DESIGNATED PRINCIPAL ORGANIC HAZARDOUS CONSTITUENTS (POHC); AND
- THE AIR POLLUTION CONTROL SYSTEM WILL ACHIEVE PERFORMANCE STANDARDS OF (1) HYDROGEN CHLORIDE OF LESS THAN 4 POUNDS/HOUR AND (2) PARTICULATE MATTER OF LESS THAN 0.08 GRAINS PER DAY FT<sup>3</sup> IN THE EXHAUST GAS CORRECTED OXYGEN CONTENT.

ONE LOCALIZED AREA OF THE FARM CHEMICALS AREA (AREA OF SSS-119) WAS CONTAMINATED WITH EXTREMELY ELEVATED LEVELS OF PESTICIDES AND INORGANICS (METALS INCLUDING LEAD AND ARSENIC), AND IS BELIEVED TO BE ASSOCIATED WITH A SPILL. THIS AND ANY OTHER AREA DETERMINED TO BE CONTAMINATED WITH HIGH CONCENTRATIONS OF INORGANICS SHOULD BE ISOLATED FROM THE REST OF THE MATERIAL AND TREATED SEPARATELY TO ISOLATE THE ASH. ASH FROM THE INCINERATION OF THIS MATERIAL WILL LIKELY CONTAIN HIGH LEVELS OF INORGANICS AND MAY NOT PASS RCRA-CHARACTERISTIC TESTING, AND NEED ADDITIONAL TREATMENT (STABILIZATION/SOLIDIFICATION) AND TESTING PRIOR TO DISPOSAL. THE AMOUNT OF HIGHLY CONTAMINATED MATERIAL IN THE AREA OF SAMPLE SSS-119 IS UNKNOWN; BUT IS BELIEVED TO BE VERY SMALL. THE BULK OF THE CONTAMINATED SOIL AND DEBRIS TO BE TREATED IS LOW IN INORGANICS, THUS THE ASH SHOULD PASS RCRA-CHARACTERISTIC TESTING AND BE NON-HAZARDOUS. RCRA-CHARACTERISTIC TESTING OF ASH FROM THE 1986 TEST BURN AT THE FAIRWAY SIX AREA WAS NON-HAZARDOUS.

FOR CONVENIENCE AND PRACTICALITY, THE ON-SITE INCINERATION UNIT WILL BE MOBILIZED AT A

CENTRALIZED LOCATION. THIS PROCEDURE WILL SAVE TIME AND MONEY BY AVOIDING THE NECESSITY OF SETTING-UP AND BREAKING-DOWN THE UNIT AT EACH AREA. UNDER CERCLA S 104(D)(4) AND THE NCP, 40 CFR SS 300.5 AND 300.4(E)(1), EPA MAY TREAT TWO OR MORE NONCONTIGUOUS FACILITIES AS A SINGLE FACILITY WHERE THEY ARE REASONABLY RELATED ON THE BASIS OF GEOGRAPHY, OR ON THE BASIS OF THE THREAT OR POTENTIAL THREAT FOR THE PURPOSE OF TAKING RESPONSE ACTION. HOWEVER, WASTES TRANSPORTED BETWEEN AREAS MUST BE MANIFESTED AS REQUIRED BY RCRA.

THE APPROXIMATE AREAS THAT REQUIRE EXCAVATION BASED ON THE (10-6) HEALTH-BASED TARGET CLEANUP LEVELS ARE SHOWN IN FIGURES 17 THROUGH 21 IN SECTION 9.0 OF THIS DOCUMENT.

DURING THE EXCAVATION AT FARM CHEMICALS AREA, SOME OF THE BUILDINGS MAY HAVE TO BE DEMOLISHED BECAUSE THEIR FOUNDATIONS WILL BE UNDERMINED. THESE BUILDINGS WILL BE DISPOSED OF IN A MANNER SIMILAR TO THE ONE DESCRIBED IN ALTERNATIVE 3-MULTIMEDIA CAP.

FOLLOWING TREATMENT, THE VOLUME OF RESIDUAL ASH DEPENDS ON THE COMPOSITION OF THE FEED MATERIAL - THE GREATER THE PERCENTAGE OF INCOMBUSTIBLE INORGANICS (I.E., MOST SOIL FORMING MINERALS), THE GREATER THE RESIDUAL ASH. VOLUME REDUCTION OF MATERIAL IN BURIED TRENCHES IS EXPECTED TO BE GREATER THAN THAT FOR THE CONTAMINATED SOILS, THE VOLUME OF WHICH SHOULD ONLY BE REDUCED BY A MAXIMUM OF (10-15) PERCENT.

THE MAJOR COSTS OF THIS ALTERNATIVE ARE THE EXCAVATION AND INCINERATION OF THE CONTAMINATED MATERIAL. ON-SITE INCINERATION COST ESTIMATES RANGE FROM \$200 - \$350 PER TON; \$250 PER TON WAS USED FOR ESTIMATING PURPOSES. EXCAVATION COST ESTIMATES RANGED FROM \$10-\$18 PER CUBIC YARD; \$12 PER CUBIC YARD WAS BEING USED FOR ESTIMATING PURPOSES.

UNDER THIS ALTERNATIVE VARIOUS ON AND OFF-SITE DISPOSAL OPTIONS WERE CONSIDERED DEPENDING ON THE NATURE OF THE TREATMENT RESIDUALS. COST ESTIMATES FOR INCINERATION AND DISPOSAL ARE DISCUSSED BELOW.

#### OPTION 1 - ON-SITE NON RCRA ASH DISPOSAL (ALTERNATIVE 5 - OPTION A-1 IN FS)

UNDER OPTION 1, AFTER CONFIRMING THROUGH SAMPLING AND ANALYSIS THAT THE INCINERATOR ASH IS NON-HAZARDOUS, THE ASH WOULD BE DISPOSED ON-SITE IN THE AREA WHERE THE SOIL ORIGINATED. IF THE TREATED ASH REMAINS HAZARDOUS DUE TO ORGANIC CONSTITUENTS, THE SOIL WILL BE REPROCESSED TO REMOVE THE ORGANICS IN IT TO BELOW TOXIC LEVELS. THE ASH WOULD BE COVERED WITH CLEAN FILL AND REVEGETATED. IF THIS OPTION IS IMPLEMENTED AT A SINGLE CENTRAL LOCATION, THE CAPITAL AND PRESENT WORTH COSTS ARE ESTIMATED AT \$48,638,000 AND \$50,439,000, RESPECTIVELY.

PRESENT WORTH COST ESTIMATES FOR IMPLEMENTING THIS REMEDY SEPARATELY AT EACH AREA ARE PRESENTED BELOW.

AREA	PRESENT WORTH BASE
FARM CHEMICALS	\$24,384,000
TWIN SITES	\$13,439,000
FAIRWAY SIX	\$ 8,792,000
MCIVER DUMP	\$ 3,515,000
ROUTE 211	\$ 3,084,000
TOTAL	\$53,214,000

#### OPTION 2 - ON-SITE NON RCRA ASH DISPOSAL AFTER SOLIDIFICATION/STABILIZATION (ALTERNATIVE 5 - OPTION A-2 IN FS)

UNDER OPTION 2, IF THE ASH REMAINING AFTER TREATMENT IS HAZARDOUS, OR THE TREATMENT GOALS ARE NOT ACHIEVED, ADDITIONAL TREATMENT THROUGH STABILIZATION/SOLIDIFICATION WOULD BE REQUIRED PRIOR TO DISPOSING THE ASH ON-SITE.

THE ASH WILL BE MIXED WITH THE STABILIZING/SOLIDIFYING AGENTS AND ALLOWED TO CURE. THE SOLIDIFIED MASS MUST UNDERGO ADDITIONAL RCRA-CHARACTERISTIC TESTING AND DETERMINED TO BE AT A NON-HAZARDOUS LEVEL. AS MENTIONED ABOVE, FINAL DISPOSAL OF THE MATERIAL WILL BE ACCOMPLISHED BY

TRANSPORTING THE TREATED MATERIAL BACK TO EACH AREA AND DISPOSING BACK INTO THE EXCAVATED AREA. HOWEVER, THE VOLUME WILL INCREASE APPROXIMATELY 20 PERCENT DUE TO THE ADDITION OF THE SOLIDIFICATION AGENTS (ASSUMING 1 YD3 EQUALS 1 TON).

ADDITIONAL STABILIZATION/SOLIDIFICATION COSTS ARE \$2,977,000. THESE COSTS RANGED FROM \$30 - \$50 PER CUBIC YARD; \$30 PER CUBIC YARD WAS USED FOR COST ESTIMATION PURPOSES. IF THIS OPTION IS IMPLEMENTED AT A SINGLE CENTRAL LOCATION, THE ESTIMATED CAPITAL AND PRESENT WORTH COSTS ARE \$53,269,000 AND \$55,070,000, RESPECTIVELY.

PRESENT WORTH COST ESTIMATES FOR IMPLEMENTING THIS REMEDY SEPARATELY AT EACH AREA ARE PRESENTED BELOW.

AREA	PRESENT WORTH BASE
FARM CHEMICALS	\$27,285,000
TWIN SITES	\$15,033,000
FAIRWAY SIX	\$ 9,777,000
MCIVER DUMP	\$ 3,799,000
ROUTE 211	\$ 3,353,000
TOTAL	\$59,247,000

#### OPTION 3 - OFF-SITE MUNICIPAL LANDFILL ASH DISPOSAL (ALTERNATIVE 5 - OPTION B IN FS)

UNDER OPTION 3 THE NON-HAZARDOUS ASH IS DISPOSED OF IN AN OFF-SITE MUNICIPAL LANDFILL. THE ASH WILL BE LOADED INTO TRUCKS AND TRANSPORTED TO THE LOCAL MUNICIPAL LANDFILL, A DISTANCE OF LESS THAN 5 MILES. IF THE ASH IS TESTED HAZARDOUS, SECONDARY TREATMENT, SUCH AS STABILIZATION/SOLIDIFICATION, CAN BE PERFORMED WITH THE SOLIDIFIED MASS BEING RETESTED PRIOR TO DISPOSAL. THE EXCAVATED AREAS WILL BE BACKFILLED WITH CLEAN FILL MATERIAL AND REVEGETATED.

IT IS ESTIMATED TO COST \$10 PER CUBIC YARD OR TON TO DISPOSE OF THE TREATED SOIL IN THE LOCAL MUNICIPAL LANDFILL. A COST ESTIMATE OF \$15 WAS USED FOR THE DISPOSAL COST ESTIMATE, WHICH ALSO INCLUDES TRANSPORTATION TO THE LANDFILL. IF THIS OPTION IS IMPLEMENTED AT A SINGLE CENTRAL LOCATION, THE ESTIMATED CAPITAL AND PRESENT WORTH COSTS IS \$51,026,000, AND \$52,842,000, RESPECTIVELY.

PRESENT WORTH COST ESTIMATES FOR IMPLEMENTING THIS REMEDY SEPARATELY AT EACH AREA ARE PRESENTED BELOW.

AREA	PRESENT WORTH BASE
FARM CHEMICALS	\$24,958,000
TWIN SITES	\$13,905,000
FAIRWAY SIX	\$ 9,081,000
MCIVER DUMP	\$ 3,558,000
ROUTE 211	\$ 3,165,000
TOTAL	\$54,667,000

#### OPTION 4 - OFF-SITE RCRA LANDFILL ASH DISPOSAL (ALTERNATIVE 5 - OPTION D IN FS)

UNDER OPTION 4 THE ASH WOULD BE DISPOSED OF IN AN OFF-SITE RCRA SUBTITLE C FACILITY. IT IS ASSUMED THAT THE HAZARDOUS COMPONENTS ARE INORGANIC. THE ORGANICS SHOULD BE DESTROYED IN THE INCINERATION PROCESS.

ASH FROM THE INCINERATOR WOULD BE LOADED INTO TRUCKS AND HAULED TO THE RCRA FACILITY FOR TREATMENT (STABILIZATION/SOLIDIFICATION) AND ULTIMATE DISPOSAL. THE LAIDLAW FACILITY IN SOUTH CAROLINA, LOCATED APPROXIMATELY 150 MILES SOUTH OF ABERDEEN, WAS USED FOR RCRA DISPOSAL COST ESTIMATING. EXCAVATED TRENCHES WOULD BE BACKFILLED WITH CLEAN FILL MATERIAL AND REVEGETATED.

DISPOSAL COST ESTIMATES FROM THE LAIDLAW FACILITY WITH STABILIZATION/SOLIDIFICATION WERE \$250 PER TON WITH AN ADDITIONAL \$30 PER TON CHARGE FOR OUT OF STATE WASTES (A TOTAL OF \$280.00 PER TON, EXCLUDING STATE TAX). IF THIS OPTION IS IMPLEMENTED AT A SINGLE CENTRAL LOCATION, THE ESTIMATED CAPITAL AND PRESENT WORTH COSTS ARE \$91,733,000 AND \$93,534,000 RESPECTIVELY. TOTAL OPERATION AND MAINTENANCE COSTS ARE \$115,000.

PRESENT WORTH COST FOR IMPLEMENTING THIS REMEDY SEPARATELY AT EACH AREA ARE PRESENTED BELOW.

AREA	PRESENT WORTH BASE
FARM CHEMICALS	\$45,876,000
TWIN SITES	\$25,400,000
FAIRWAY SIX	\$16,186,000
MCIVER DUMP	\$ 5,944,000
ROUTE 211	\$ 5,098,000
TOTAL	\$98,504,000

ALTERNATIVE 5: OFF-SITE INCINERATION (ALTERNATIVE 6 IN FS)

UNDER THIS ALTERNATIVE THE CONTAMINATED MATERIAL WOULD BE EXCAVATED AND TRANSPORTED TO AN OFF-SITE INCINERATOR FOR THERMAL TREATMENT AND DISPOSAL. CONTAMINATED SOIL AND DEBRIS WILL BE EXCAVATED AND TRANSPORTED TO AN OFF-SITE INCINERATOR WHERE ORGANIC CONTAMINANTS WILL BE THERMALLY DESTROYED, WITH THE ASH DISPOSED OF IN A RCRA SUBTITLE C LANDFILL. THE CONTAMINATED MATERIAL WOULD BE EXCAVATED THEN TRANSPORTED TO AN OFF-SITE INCINERATION FACILITY AND TREATED PRIOR TO DISPOSAL IN ACCORDANCE WITH LAND DISPOSAL RESTRICTIONS. DUE TO THE TYPE AND VOLUME OF MATERIAL TO BE TREATED, ONLY THREE FACILITIES WERE CONSIDERED TO BE CAPABLE OF HANDLING THE MATERIAL. ALL OF THESE FACILITIES OPERATE ROTARY KILN INCINERATORS.

OPERATOR	LOCATION	APPROX. MILES FROM SITE
CHEMICAL WASTE MANAGEMENT	SAUGET, ILLINOIS	800
CHEMICAL WASTE MANAGEMENT	PORT ARTHUR, TEXAS	1000
ROLLINS	DEER PARK, TEXAS	1300

SELECTION OF THE ACTUAL OFF-SITE INCINERATION FACILITY THAT WOULD ACCEPT THE EXCAVATED WASTES FROM THE SITE DEPENDS ON THE AVAILABILITY OF INCINERATOR CAPACITY. DUE TO THE LAND DISPOSAL RESTRICTION REGULATIONS INCINERATION CAPACITY IS LIMITED, WHICH MAY HINDER THE IMPLEMENTATION OF THIS ALTERNATIVE. THIS SHORTAGE IN CAPACITY MAY REQUIRE THE EXCAVATION AND TRANSPORT OF MATERIAL TO A FACILITY IN STAGES AS CAPACITY BECOMES AVAILABLE. THIS STAGING COULD PROLONG THE LENGTH OF TIME FOR THE REMEDIATION OF THE CONTAMINATED SOILS FROM THE SITE FROM LESS THAN A YEAR TO SEVERAL YEARS. THE INCINERATION FACILITY IS RESPONSIBLE FOR THE PROPER TREATMENT OF THE CONTAMINATED MATERIAL IN ACCORDANCE WITH RCRA INCINERATOR REGULATIONS AND FINAL DISPOSAL OF THE RESIDUAL ASH. THE AREAS REQUIRING EXCAVATION ARE SHOWN IN FIGURES 17 THROUGH 21 IN SECTION 9.0 OF THIS DOCUMENT.

ALTERNATIVE 5, THE MOST COSTLY OF THE ALTERNATIVES, HAS A TOTAL PRESENT WORTH OF \$207,327,000. THE MAJOR COSTS ARE FOR THE INCINERATION AND TRANSPORTATION OF THE CONTAMINATED MATERIAL. ALTHOUGH COST IS OVER 1 ORDER OF MAGNITUDE GREATER THAN COMPARABLE ALTERNATIVES, THIS ALTERNATIVE WAS RETAINED TO ALLOW FOR OFF-SITE TREATMENT. THE INCINERATION COST ESTIMATES RANGED FROM 45 TO 90 CENTS PER POUND (\$900 TO \$1800 PER TON), AND WERE A FACTOR OF THE BTU CONTENT OF THE MATERIAL. FOR COST ESTIMATION, 60 CENTS PER POUND (\$1200 PER TON) WAS ASSUMED. TRANSPORTATION COSTS OF \$4.00 PER LOADED MILE, OVER A DISTANCE OF 900 MILES WERE USED FOR THE COST ESTIMATION.

IF THIS OPTION IS IMPLEMENTED AT A SINGLE CENTRAL LOCATION, THE CAPITAL COSTS ARE ESTIMATED AT \$205,549,000 WITH ANNUAL OPERATION AND MAINTENANCE OF \$114,000. PRESENT WORTH COST ESTIMATES FOR IMPLEMENTING THIS REMEDY SEPARATELY AT EACH AREA ARE PRESENTED BELOW.

AREA	PRESENT WORTH BASE
FARM CHEMICAL	\$99,088,000
TWIN SITES	\$54,490,000
FAIRWAY SIX	\$33,991,000
MCIVER DUMP	\$24,880,000
ROUTE 211	\$ 9,665,000
TOTAL	\$222,114,000

#### ALTERNATIVE 6: IN-SITU VITRIFICATION (ALTERNATIVE 7 IN FS)

UNDER THIS ALTERNATIVE, THE CONTAMINATED SOIL AND DEBRIS WILL BE VITRIFIED IN PLACE. THE RESULTING MASS OF GLASSY MATERIAL WILL BE TESTED FOR HAZARDOUS CHARACTERISTICS AND LEFT IN PLACE IF IT IS FOUND NON-HAZARDOUS.

IN-SITU VITRIFICATION (ISV) IS AN INNOVATIVE THERMAL TREATMENT TECHNOLOGY WHICH VIRTUALLY ELIMINATES HANDLING OF THE CONTAMINATED MATERIAL. THIS IS ACCOMPLISHED BY INSERTING ELECTRODES INTO THE SOIL AND FLOWING AN INTENSE ELECTRICAL CURRENT BETWEEN THEM WHICH HEATS THE ADJACENT SOIL TO 2,900 - 3,600 DEGREE FAHRENHEIT, THUS CAUSING IT TO MELT. ORGANIC POLLUTANTS ARE THERMALLY DECOMPOSED (PYROLYZED), WHILE NON-VOLATILE INORGANICS ARE DISSOLVED IN PLACE AND INCORPORATED INTO THE MELT. VOLATILE ORGANIC AND INORGANIC OFF-GASES ARE COLLECTED BY A NEGATIVE PRESSURE HOOD INSTALLED ABOVE THE TREATMENT AREA AND PROCESSING IN THE OFF-GAS TREATMENT SYSTEM. THE RESULTING END PRODUCT IS AN INERT, EXTREMELY STABLE GLASS-LIKE SOLID MASS WITH A SMALLER VOLUME (TYPICALLY 20 - 40 PERCENT) THAN THE ORIGINAL SOIL/WASTE. WHEN THE MELT HAS ENCOMPASSED THE ENTIRE TREATMENT VOLUME, IT IS LEFT TO COOL (SEVERAL MONTHS) AND IS THEN COVERED WITH CLEAN FILL MATERIAL AND REVEGETATED. THE POWER SOURCE MAY EITHER BE A LOCAL UTILITY OR, IN A REMOTE AREA, A DIESEL GENERATOR.

THE ESTIMATED AREA OF CONTAMINATED SOIL AND DEBRIS REQUIRING VITRIFICATION IS IDENTICAL TO THE AREAS REQUIRING EXCAVATION THAT WAS SHOWN IN FIGURES 17 THROUGH 21 IN SECTION 9.0 OF THIS DOCUMENT. THE ESTIMATED VOLUME OF THE SITE MATERIAL TO BE TREATED INCLUDING A 5 PERCENT OVERMELT IS:

AREA	VOLUME (YD3)
FARM CHEMICALS	50,865
TWIN SITES	27,947
FAIRWAY SIX	17,276
MCIVER DUMP*	6,237
ROUTE 211	4,705
TOTAL	107,030

\* VOLUME INCLUDES THE 3,200 YD3 OF CONTAMINATED MATERIAL STOCKPILED AT THE MCIVER DUMP AREA.

AREAS ESTIMATED TO REQUIRE REMEDIATION TO A DEPTH OF ONLY FIVE FEET MAY NEED TO BE EXCAVATED AND CONSOLIDATED IN A DEEPER CONFIGURATION TO FACILITATE THE ISV PROCESS. SIMILARLY, THE STOCKPILED MATERIAL AT THE MCIVER DUMP AREA MUST BE TRANSFERRED TO A TRENCH IN ORDER TO VITRIFY IT.

IN ORDER TO MONITOR THE EFFECTIVENESS OF THIS TECHNOLOGY, SOIL SAMPLES ARE COLLECTED ADJACENT TO THE OUTER EDGE OF THE MELT TO BE CERTAIN THAT IT HAS INCORPORATED THE DESIRED AREA/VOLUME. WHEN THE MELT HAS COOLED AND HARDENED, SAMPLES OF THE GLASS ARE OBTAINED AND TESTED FOR RCRA TOXIC CHARACTERISTICS. ALL DATA INDICATE THAT THE RESIDUAL GLASS MONOLITH WILL BE VERY RESISTANT TO LEACHING, AND WILL REQUIRE NO FUTURE MONITORING OR REMEDIATION.

THE MAXIMUM AREA WHICH THIS TECHNOLOGY CAN TREAT WITH ONE SETTING OF THE ELECTRODES IS APPROXIMATELY 30 X 30 FT; THE MAXIMUM DEPTH IS ALSO 30 FEET. ONLY 800 TO 1,000 TONS OF MATERIAL CAN BE TREATED PER SETTING; WHICH, FOR MOST SOIL MATRIX APPLICATIONS, LIMITS THE VOLUME PER TREATMENT TO SLIGHTLY LESS THAN THE MAXIMUM DIMENSIONS. THE MANY SITE- AND APPLICATION-SPECIFIC

VARIABLES OF THIS TECHNOLOGY NECESSITATE TREATABILITY AND PILOT SCALE STUDIES BEFORE FULL-SCALE OPERATION.

COST FOR THE ISV PROCESS INCLUDES TREATABILITY AND PILOT-SCALE TESTS, MOBILIZATION AND DEMOBILIZATION OF THE VITRIFICATION UNIT, AND THE ESTIMATED COST PER TON FOR THE VITRIFICATION OPERATIONS. COSTS WHICH ARE NOT INCLUDED, BECAUSE A SITE VISIT BY THE CONTRACTOR HAS NOT OCCURRED, ARE SITE CHARACTERIZATION, SITE PREPARATION/CONSTRUCTION OPERATIONS, PERMITTING/REGULATORY COMPLIANCE, DEWATERING OPERATIONS (MAY BE REQUIRED IN THE NORTHERN AREAS OF THE TWIN SITES AREA), SITE RESTORATION, DELISTING OF THE REMAINING VITRIFIED MASSES (IF NECESSARY), AND SECONDARY WASTE DISPOSAL.

IF THIS OPTION IS IMPLEMENTED AT A SINGLE CENTRAL LOCATION, THE ESTIMATED CAPITAL AND PRESENT WORTH COSTS ARE \$50,257,000, AND \$52,101,000, RESPECTIVELY. ANNUAL OPERATION AND MAINTENANCE ARE ESTIMATED AT \$117,000. IMPLEMENTATION TIME IS ESTIMATED TO BE 3 YEARS. PRESENT WORTH COSTS FOR IMPLEMENTING THIS ALTERNATIVE SEPARATELY AT EACH AREA ARE PRESENTED BELOW:

AREA	PRESENT WORTH BASE
FARM CHEMICALS	\$24,648,000
TWIN SITES	\$13,761,000
FAIRWAY SIX	\$ 8,864,000
MCIVER DUMP	\$ 3,584,000
ROUTE 211	\$ 2,786,000
TOTAL	\$53,643,000

#### ALTERNATIVE 7: THERMAL DESORPTION/SEPARATION (ALTERNATIVE 8 IN FS)

UNDER THIS ALTERNATIVE, CONTAMINATED SOIL AND DEBRIS WOULD BE EXCAVATED AND TREATED UTILIZING LOW TEMPERATURE THERMAL TECHNOLOGY. TREATED SOIL WILL BE TESTED FOR RCRA CHARACTERISTICS, LDR TREATABILITY VARIANCE LEVELS, AND COMPLIANCE WITH OTHER TREATMENT REQUIREMENTS AND RETURNED TO THE EXCAVATED AREA IF FOUND TO BE NON-HAZARDOUS AND CONSISTENT WITH THE CLEAN-UP CRITERIA. THE VOLUME OF CONTAMINATED SOIL AND DEBRIS AND THE EXCAVATION PROCEDURES ARE IDENTICAL TO THOSE DESCRIBED IN SECTION 9.0 OF THIS DOCUMENT (FIGURES 17 THROUGH 21). TREATMENT WILL CONSIST OF VOLATILIZING THE ORGANIC CONTAMINANTS AT A TEMPERATURE GENERALLY LESS THAN 1000 DEGREE FAHRENHEIT WITH THE OFF-GASES BEING CAPTURED AND TREATED TO PREVENT THE RELEASE OF CONTAMINANTS. OFF-GAS TREATMENT VARIES DEPENDING ON THE VENDOR, BUT USUALLY CONSISTS OF: (1) THERMAL OXIDATION IN A SECONDARY THERMAL OXIDATION CHAMBER SIMILAR TO INCINERATORS; OR (2) CONDENSING AND CONCENTRATING THE ORGANICS INTO A SIGNIFICANTLY SMALLER MASS FOR FURTHER TREATMENT (INCINERATION); OR (3) PASSING THE OFF-GASES THROUGH ACTIVATED CARBON TO ADSORB IN THE CONTAMINANTS AND THEN REGENERATING THE CARBON. FOR COST ESTIMATION PURPOSES, IT WAS ASSUMED THAT A SMALLER CONCENTRATED ORGANIC MASS WOULD REQUIRE INCINERATION IN AN OFF-SITE RCRA FACILITY.

THE VOLUME OR WEIGHT OF THE CONDENSED MASS DEPENDS ON THE AMOUNT OF ORGANICS PRESENT IN THE SOIL AT EACH AREA. TO APPROXIMATE A VOLUME OR WEIGHT FOR POST TREATMENT, THE AVERAGE TOTAL PESTICIDE CONCENTRATION (MG/KG) AT EACH AREA WAS CONVERTED TO PERCENT ORGANICS AND WAS ASSUMED TO BE REPRESENTATIVE OF ALL THE MATERIAL EXCAVATED FROM THAT AREA. THE PERCENT ORGANICS WAS MULTIPLIED BY THE VOLUME/WEIGHT OF MATERIAL TO BE EXCAVATED (ASSUMING 1 YD3 OF MATERIAL WEIGHS 1 TON) TO OBTAIN THE RESULTING WEIGHT OF CONDENSATE FOR ADDITIONAL TREATMENT. THE VOLUME OF MATERIAL TO BE TREATED AT EACH AREA AND THE RESULTING CONDENSATE FOR POST TREATMENT IS ESTIMATED TO BE:

AREA	EXCAVATED MATERIAL (TONS)	PERCENT ORGANICS*	CONDENSATE (TONS)
FARM CHEMICALS	48,443	0.056	27.13
TWIN SITES	26,616	0.005	1.33
FAIRWAY SIX	16,453	0.0007	0.1
MCIVER DUMP	5,940	0.006	0.35
ROUTE 211	4,481	0.057	2.55
TOTAL	101,933		31.46

\* TOTAL PESTICIDES ONLY

THE OFF-GASES WILL PASS THROUGH AN AIR POLLUTION CONTROL SYSTEM CONSISTING OF CYCLONIC SEPARATORS AND BAGHOUSE AND SCRUBBERS TO REMOVE PARTICULATES AND HCL EITHER PRIOR TO OR AFTER TREATMENT OF THE OFF-GASES, DEPENDING ON THE TREATMENT SYSTEM. SCRUBBER BLOWDOWN WATER CAN EITHER BE REPROCESSED THROUGH THE SYSTEM OR TREATED WITH ACTIVATED CARBON AND THEN USED TO QUENCH THE TREATED (HOT) SOIL. TYPICALLY, AIR EMITTED TO THE ATMOSPHERE IS PASSED THROUGH A BED OF ACTIVATED CARBON TO INSURE THAT IT IS FREE OF CONTAMINANTS.

TREATED SOIL WILL BE ANALYZED FOR RCRA HAZARDOUS CHARACTERISTICS AND LAND DISPOSAL RESTRICTIONS AND DISPOSED BACK INTO THE EXCAVATED AREAS IF FOUND NON-HAZARDOUS. IF HAZARDOUS DUE TO INORGANICS (METALS), THE TREATED SOIL MUST UNDERGO ADDITIONAL TREATMENT, SUCH AS STABILIZATION/SOLIDIFICATION, AND RETESTING PRIOR TO DISPOSAL. IF HAZARDOUS DUE TO ORGANICS, THE SOIL WILL BE REPROCESSED TO REMOVE THE ORGANICS IN IT TO BELOW TOXIC LEVELS.

ANY STOCKPILE OF CONTAMINATED MATERIAL MUST MEET RCRA STORAGE REQUIREMENTS TO PREVENT FURTHER CONTAMINATION OF THE ENVIRONMENT.

AS WITH ALTERNATIVE 4 - ON-SITE INCINERATION, THIS ALTERNATIVE CAN BE IMPLEMENTED AT A CENTRAL LOCATION. THE THERMAL DESORPTION SYSTEM WOULD BE LOCATED IN THAT CENTRAL LOCATION. SUSPECTED AREAS WITH HIGH INORGANIC CONTAMINATION (LOCALIZED SPILLS) SHOULD BE ISOLATED AND TREATED SEPARATELY TO MINIMIZE THE POTENTIAL FOR SECONDARY TREATMENT OF THE SOIL.

THE MAJOR COSTS ASSOCIATED WITH THIS ALTERNATIVE ARE FOR THE EXCAVATION OF CONTAMINATED SOIL AND DEBRIS, TREATMENT OF THE SOIL AND RETURNING THE SOIL TO THE EXCAVATED AREAS. THE COST RANGES FROM APPROXIMATELY \$50 TO \$225 PER TON, AND IS DEPENDENT ON THE TYPE OF SYSTEM/VENDOR. ADDITIONALLY, SOME PRICE ESTIMATES INCLUDED THE POST TREATMENT COSTS, SUCH AS REGENERATION OF CARBON. THE COST VARIATIONS SHOULD BE TAKEN INTO CONSIDERATION IF THIS ALTERNATIVE IS CHOSEN FOR REMEDIATION.

FOR COST ESTIMATING PURPOSES, A BASE COST OF \$125 PER TON WAS ASSUMED FOR TREATMENT OF THE SOIL, WITH A +40 PERCENT AND -30 PERCENT COST VARIATION FOR THE HIGH AND LOW COST ESTIMATES, RESPECTIVELY. ADDITIONALLY, THE COST FOR TRANSPORTING, TREATING, AND DISPOSING OF A RESIDUAL ORGANIC CONTAMINATED MASS IN A RCRA FACILITY WAS ALSO INCLUDED IN THIS ESTIMATE. IF THIS OPTION IS IMPLEMENTED AT A SINGLE LOCATION, THE ESTIMATED CAPITAL AND PRESENT WORTH COSTS ARE \$27,314,000 AND \$29,115,000, RESPECTIVELY. SHOULD THIS ALTERNATIVE BE FINANCED AND IMPLEMENTED SEPARATELY AT EACH AREA, THE ESTIMATED PRESENT WORTH COST ARE PRESENTED BELOW.

AREA	PRESENT WORTH BASE
FARM CHEMICALS	\$14,010,000
TWIN SITES	\$ 7,867,000
FAIRWAY SIX	\$ 5,350,000
MCIVER DUMP	\$ 2,316,000
ROUTE 211	\$ 2,138,000
TOTAL	\$31,681,000



THE ESTIMATED TIME REQUIRED TO COMPLETE THE SOIL REMEDIATION WITH ONE MOBILE THERMAL DESORPTION UNIT IS APPROXIMATELY 2.3 YEARS, ASSUMING A PROCESS RATE OF 5 TONS PER HOUR.

## **#SCAA**

### **8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES**

THE REMEDIAL ALTERNATIVES DEVELOPED DURING THE ABERDEEN PESTICIDE DUMPS SITE FS WERE EVALUATED BY THE USEPA AND THE NCDEHNR USING NINE CRITERIA, PURSUANT TO THE NCP, 40 CFR S 300.430(E). THE ADVANTAGES AND DISADVANTAGES OF EACH ALTERNATIVE WERE THEN COMPARED TO IDENTIFY THE ALTERNATIVE PROVIDING THE BEST BALANCE AMONG THESE NINE CRITERIA DEFINED BELOW.

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT ADDRESSES WHETHER A REMEDY PROVIDES ADEQUATE PROTECTION AND DESCRIBES HOW RISKS POSED THROUGH EACH PATHWAY ARE ELIMINATED, REDUCED, OR CONTROLLED THROUGH TREATMENT, ENGINEERING CONTROLS, OR INSTITUTIONAL CONTROLS.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) ADDRESSES WHETHER A REMEDY WILL MEET FEDERAL AND STATE ARARS OR JUSTIFIES A WAIVER.

LONG-TERM EFFECTIVENESS AND PERMANENCE REFERS TO EXPECTED RESIDUAL RISK AND THE ABILITY OF A REMEDY TO MAINTAIN RELIABLE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT OVER TIME, ONCE CLEAN UP GOALS HAVE BEEN MET.

REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT IS THE ANTICIPATED PERFORMANCE OF THE TREATMENT TECHNOLOGIES A REMEDY MAY EMPLOY.

SHORT-TERM EFFECTIVENESS INVOLVES THE PERIOD OF TIME NEEDED TO ACHIEVE PROTECTION AND ANY ADVERSE IMPACTS ON HUMAN HEALTH AND THE ENVIRONMENT THAT MAY BE POSED DURING THE CONSTRUCTION AND IMPLEMENTATION PERIOD, UNTIL CLEANUP OBJECTIVES ARE ACHIEVED.

IMPLEMENTABILITY IS THE TECHNICAL AND ADMINISTRATIVE FEASIBILITY OF A REMEDY, INCLUDING THE AVAILABILITY OF MATERIALS AND SERVICES NEEDED TO IMPLEMENT A PARTICULAR OPTION.

COST INCLUDES ESTIMATED CAPITAL AND OPERATION AND MAINTENANCE COSTS, AS WELL AS PRESENT WORTH COSTS.

STATE ACCEPTANCE SHOULD BE USED TO INDICATE THE SUPPORT AGENCIES' COMMENTS.

COMMUNITY ACCEPTANCE SUMMARIZES THE PUBLIC'S GENERAL RESPONSE TO THE ALTERNATIVES DESCRIBED IN THE PROPOSED PLAN AND RI/FS REPORTS. THE SPECIFIC RESPONSES TO PUBLIC COMMENTS ARE ADDRESSED IN THE RESPONSIVENESS SUMMARY.

A MATRIX SUMMARIZING THE COMPARATIVE ANALYSIS OF ALTERNATIVES ON A CRITERIA BY CRITERIA BASIS IS PRESENTED IN TABLE 26. THE FOLLOWING DISCUSSION EXPOUNDS ON THE INFORMATION PROVIDED IN TABLE 26.

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT: ALTERNATIVES 4 THROUGH 7 OFFER THE MOST PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT BY THERMALLY DESTROYING THE ORGANIC CONTAMINANTS BY ELIMINATING, REDUCING, OR CONTROLLING RISK THROUGH TREATMENT. THE NO ACTION ALTERNATIVE DOES NOT PROTECT HUMAN HEALTH AND THE ENVIRONMENT. THE LONG-TERM PROTECTION OF A MULTIMEDIA CAP (ALTERNATIVE 3) IS QUESTIONABLE. THE PREFERRED ALTERNATIVE WOULD TREAT THE ORGANIC CONTAMINANTS IN THE SOILS TO ELIMINATE UNACCEPTABLE RISKS FROM DIRECT CONTACT. TREATMENT OF CONTAMINATED SOILS WOULD SUBSEQUENTLY ELIMINATE THE MIGRATION OF CONTAMINANTS INTO THE UNDERLYING GROUNDWATER AQUIFER.

COMPLIANCE WITH ARARS: ALL OF THE ALTERNATIVES EXCEPT NO ACTION AND ENVIRONMENTAL MONITORING WILL COMPLY WITH THE EXISTING ARARS. ALTERNATIVE 6 ISV, TREATS THE CONTAMINATED SOIL AND DEBRIS IN PLACE, THUS RCRA LAND DISPOSAL RESTRICTIONS (LDR) SHOULD NOT BE APPLICABLE. IN ALTERNATIVES 4 AND 5, EXCAVATING, STOCKPILING, AND TREATMENT OF CONTAMINATED SOIL AND DEBRIS ARE NECESSARY. THIS WILL CONSTITUTE PLACEMENT OF CONTAMINATED MATERIAL, THUS LDRS WILL BE APPLICABLE.

LONG-TERM EFFECTIVENESS AND PERMANENCE: ALTERNATIVES 4 THROUGH 7 OFFER LONG-TERM EFFECTIVENESS AND PERMANENCE FOR REMEDIATION OF THE SITE. HOWEVER, IN ALTERNATIVES 4, 5, AND 7, INORGANIC CONTAMINANTS ARE NOT VOLATILIZED OR OXIDIZED AND REMAIN IN THE SOIL, WHICH MAY REQUIRE ADDITIONAL TREATMENT TO STABILIZE THEM. IN ALTERNATIVE 6, INORGANIC CONTAMINANTS ARE INCORPORATED INTO A MELT/GLASSY MASS, WHICH IS VERY RESISTANT TO EROSION AND IS CONSIDERED IMMOBILE. UNDER ALTERNATIVES 1, 2, AND 3, THE CONTAMINATED MATERIAL AND WASTES WILL REMAIN ON-SITE; THEREFORE, THE LONG-TERM EFFECTIVENESS OF THESE ALTERNATIVES IS QUESTIONABLE, AND THEY ARE NOT CONSIDERED TO AFFORD A HIGH DEGREE OF PERMANENCE.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME OF THE CONTAMINANTS THROUGH TREATMENT: ALTERNATIVES 4 THROUGH 7 REDUCE THE TOXICITY, VOLUME AND/OR MOBILITY OF THE CONTAMINANTS THROUGH TREATMENT AND DO NOT REQUIRE LONG TERM MANAGEMENT AND MONITORING OF THE WASTES. ALTERNATIVES 1, 2, AND 3 LEAVE CONTAMINATED SOIL AND WASTES ON-SITE. UNTREATED WASTES MAY CAUSE FUTURE ENVIRONMENTAL PROBLEMS AND WILL REQUIRE LONG-TERM MANAGEMENT AND MONITORING.

SHORT-TERM EFFECTIVENESS: ALL OF THE ALTERNATIVES THAT REQUIRE SOME FORM OF REMEDIATION WILL TEMPORARILY INCREASE THE RISKS TO PUBLIC HEALTH AND THE ENVIRONMENT DURING THEIR IMPLEMENTATION. HOWEVER, THESE RISKS CAN BE MINIMIZED BY IMPLEMENTING PROPER DUST AND VAPOR CONTROL MEASURES, AND ON-SITE WORKERS CAN BE PROTECTED BY WEARING PERSONAL PROTECTION EQUIPMENT. ALTERNATIVES 1 AND 2 WILL NOT SIGNIFICANTLY INCREASE EITHER THE RISK POSED BY EACH AREA ABOVE ITS CURRENT LEVEL, OR THE SHORT TERM RISKS.

IMPLEMENTABILITY: ALL OF THE ALTERNATIVES ARE IMPLEMENTABLE. IMPLEMENTATION OF ALTERNATIVES 4, 6, AND 7 MAY DEPEND ON THE AVAILABILITY OF MOBILE INCINERATION, ISV, AND THERMAL DESORPTION EQUIPMENT, RESPECTIVELY. MOBILE INCINERATION EQUIPMENT IS AVAILABLE FROM NUMEROUS COMPANIES; HOWEVER, ISV EQUIPMENT IS ONLY AVAILABLE FROM A SINGLE COMPANY. THERMAL DESORPTION EQUIPMENT IS AVAILABLE FROM SEVERAL COMPANIES; HOWEVER, EACH SYSTEM DIFFERS IN THE WAY IT TREATS THE OFF-GASES, WHICH MUST BE CONSIDERED WHEN CHOOSING A VENDOR. ALTERNATIVE 5 OFF-SITE INCINERATION, MAY HAVE TO BE IMPLEMENTED IN STAGES, DEPENDING ON OFF-SITE INCINERATOR CAPACITY.

COST: THE PRESENT WORTH COST OF THE VARIOUS ALTERNATIVES RANGE FROM \$1,777,000 FOR ENVIRONMENTAL MONITORING TO \$203,327,000 FOR OFF-SITE INCINERATION. OBVIOUSLY, THE ALTERNATIVES THAT REQUIRE TREATMENT AND/OR OFF-SITE DISPOSAL ARE THE MOST EXPENSIVE, BUT ARE ALSO THE MOST PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. ALTERNATIVE 5, OFF-SITE INCINERATION, IS 7 TIMES MORE EXPENSIVE THEN OTHER ALTERNATIVES OFFERING THE SAME LEVEL OF PROTECTION. EPA BELIEVES THAT THE MOST COST-EFFECTIVE ALTERNATIVE IS ALTERNATIVE 7-EXCAVATION, ON-SITE THERMAL DESORPTION, AND ON-SITE ASH DISPOSAL, AT AN ESTIMATED PRESENT WORTH COST OF \$29,115,000, WHICH PROVIDES THE GREATEST PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT FOR THE COST.

STATE ACCEPTANCE: THE STATE OF NORTH CAROLINA PREFERS A TREATMENT ALTERNATIVE TO REMEDIATE CONTAMINATED SOIL. A STATEMENT WAS READ ON BEHALF OF NORTH CAROLINA'S SOLID WASTE DIVISION AT EPA'S MAY 30, 1991 PUBLIC MEETING SUPPORTING EPA'S PROPOSED PLAN. THE STATE OF NORTH CAROLINA FULLY SUPPORTED EPA'S PROPOSED PLAN AND DID NOT COMMENT ON ANY OF THE OTHER ALTERNATIVES EVALUATED BY EPA. A STATE LETTER OF CONCURRENCE IS INCLUDED AS AN ATTACHMENT TO THIS RECORD OF DECISION.

COMMUNITY ACCEPTANCE: BASED ON COMMENTS RECEIVED BOTH ORALLY AND WRITTEN, THE COMMUNITY GENERALLY SUPPORTS EPA'S PLAN TO REMEDIATE CONTAMINATED SOIL UTILIZING THERMAL DESORPTION. ONE CITIZEN PREFERRED THE USE OF THE ISV TECHNOLOGY. A PARTICIPANT AT THE PUBLIC MEETING SUGGESTED THAT NO ACTION BE TAKEN. THE LEAGUE OF WOMEN VOTERS, AN ACTIVE LOCAL GROUP, FULLY SUPPORTS EPA'S PLAN FOR REMEDIATION. SUPPORT WAS ALSO RECEIVED ORALLY FROM THE NORTH CAROLINA CLEAN WATER FUND.

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## **9.0 THE SELECTED REMEDY**

THE SELECTED REMEDY IS ALTERNATIVE 7-EXCAVATION, ON-SITE THERMAL DESORPTION, ON-SITE ASH DISPOSAL. TABLE 27 PROVIDES A DETAILED COST SUMMARY FOR ALTERNATIVE 7. COMMON ELEMENTS OF THE SELECTED REMEDY TO EACH AREA ARE DISCUSSED BELOW.

## 9.1 COMMON ELEMENTS

### EXCAVATION GOALS

EXCAVATION OF CONTAMINATED SOIL WILL BE REQUIRED AT EACH AREA COMPRISING THE SITE. AREAS REQUIRING EXCAVATION ARE IDENTIFIED IN FIGURES 17 THROUGH 21. STEPS SHOULD BE TAKEN DURING THE REMOVAL PROCESS TO PREVENT OR MINIMIZE THE TRANSPORT OF SOIL PARTICLES FROM THE AREAS TO THE AQUATIC SYSTEM VIA EROSION AND STORM WATER RUNOFF.

THE TOTAL VOLUME OF CONTAMINATED SOIL REQUIRING EXCAVATION FROM THE SITE IS 98,733 CUBIC YARDS. THE DEPTHS AT WHICH AREAS ARE TO BE EXCAVATED AND THE VOLUME REQUIRING REMEDIATION ARE IDENTIFIED IN TABLE 28. INCLUDED IN THE VOLUME TO BE REMEDIATED ARE 3,200 CY AND 22,000 CY OF PREVIOUSLY EXCAVATED AND STOCKPILED CONTAMINATED SOIL AT THE MCIVER DUMP AND FAIRWAY SIX AREAS, RESPECTIVELY. VOLUME BY AREA OF CONTAMINATED SOIL REQUIRING EXCAVATION AND REMEDIATION IS:

AREA	VOLUME TO BE EXCAVATED	VOLUME TO BE REMEDIATED
FARM CHEMICALS	48,443 CUBIC YARDS	48,443 CUBIC YARDS
TWIN SITES AREA	26,616 CUBIC YARDS	26,616 CUBIC YARDS
FAIRWAY SIX AREA	16,453 CUBIC YARDS	38,453 CUBIC YARDS
MCIVER DUMP AREA	2,740 CUBIC YARDS	5,940 CUBIC YARDS
ROUTE 211 AREA	4,481 CUBIC YARDS	4,481 CUBIC YARDS
TOTAL	98,733 CUBIC YARDS	123,933 CUBIC YARDS

CLEANUP GOALS WERE DEVELOPED FOR THE PROTECTION OF DIRECT CONTACT WITH CONTAMINATED SOIL AND ARE AT THE (10-6) END OF THE PROTECTIVE RISK RANGE. THE HEALTH-BASED SOIL CLEANUP OR DIG UP GOALS ARE IDENTIFIED IN TABLE 29. THE DIRECT CONTACT HEALTH-BASED EXCAVATION GOALS IN CONJUNCTION WITH A SUBSEQUENT REMEDY SELECTION TO ADDRESS DOCUMENTED CONTAMINATED GROUNDWATER WILL BE FULLY PROTECTIVE OF GROUNDWATER. THE EXCAVATION GOALS ARE NOT EXPECTED TO BE LESS THAN BACKGROUND CONCENTRATIONS OF TOTAL PESTICIDES IN THE ABERDEEN AREA. SAMPLE COLLECTION AND ANALYSIS SHALL BE CONDUCTED DURING THE REMEDIAL DESIGN PHASE TO BETTER DEFINE PESTICIDE CONCENTRATIONS IN BACKGROUND SURFICIAL SOIL.

### CENTRALIZED LOCATION FOR TREATMENT

CERCLA SECTION 104(D)(4) ALLOWS EPA TO TREAT NONCONTIGUOUS AREAS AS ONE SITE FOR THE PURPOSE OF TAKING RESPONSE ACTION. THE SITE IS COMPRISED OF FIVE NONCONTIGUOUS AREAS WHICH ARE REASONABLY CLOSE TO ONE ANOTHER (ALL AREAS ARE WITHIN A 3 MILE RADIUS). THE WASTES ARE SIMILAR OR IDENTICAL, AND ARE APPROPRIATE FOR LIKE TREATMENT. MOREOVER, ALL AREAS ARE RELATED ON THE BASIS OF THE THREAT, OR POTENTIAL THREAT TO THE PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT. FUTURE LAND USE SCENARIOS AT EACH AREA COMPRISING THE SITE FALL OUTSIDE OF EPA'S PROTECTIVE RISK RANGE BETWEEN (10-4) AND (10-6).

TREATMENT AT A CENTRAL LOCATION IS COST-EFFECTIVE, MORE EFFICIENT AND IS IN THE BEST INTERESTS OF ACHIEVING A SOUND AND EXPEDITIOUS ENVIRONMENTAL CLEANUP AT THE SITE. ALL WASTES TRANSPORTED TO THE CENTRAL TREATMENT AREA WILL BE MANIFESTED.

THE FAIRWAY SIX AND MCIVER DUMP AREAS WERE BOTH CONSIDERED AS THE CENTRAL LOCATION FOR TREATMENT AND WERE SUBJECTED TO PUBLIC COMMENT. THE FAIRWAY SIX AREA HAS BEEN SELECTED AS THE CENTRAL LOCATION FOR TREATMENT. THE REASONS FOR SELECTING THIS AREA ARE:

THE VOLUME OF CONTAMINATED SOIL REQUIRING TREATMENT AT THE FAIRWAY SIX AREA (A TOTAL OF 38,453 CY, INCLUDES 22,000 CY FROM OU TWO) REPRESENTS 31 PERCENT OF THE TOTAL VOLUME REQUIRING TREATMENT VERSUS THE VOLUME OF CONTAMINATED SOIL AT THE MCIVER DUMP AREA (A TOTAL OF 5,940 CY) REPRESENTING 5 PERCENT OF THE TOTAL VOLUME REQUIRING TREATMENT.

THE DISTANCE FROM THE FARM CHEMICALS AND TWIN SITES AREAS TO THE FAIRWAY SIX AREA IS APPROXIMATELY 1.75 MILES WHILE THE DISTANCE TO THE MCIVER DUMP AREA FROM THE FARM CHEMICALS AND TWIN SITES AREAS IS APPROXIMATELY 4.5 MILES. THE CONTAMINATED SOIL REQUIRING TREATMENT AT THE

FARM CHEMICALS, TWIN SITES AND FAIRWAY SIX AREAS REPRESENTS 92 PERCENT OF THE TOTAL VOLUME OF SOIL REQUIRING TREATMENT. LONGER TRANSPORT DISTANCE WILL BE REFLECTED IN GREATER TRANSPORTATION COSTS.

TRANSPORTATION OF CONTAMINATED SOIL TO THE FAIRWAY SIX AREA IS THROUGH A SPARSELY POPULATED INDUSTRIAL AREA WHILE TRANSPORTATION TO THE MCIVER DUMP AREA WOULD BE THROUGH A POPULATED RESIDENTIAL AREA. TO PREVENT SHORT-TERM RISKS TO RESIDENTS FROM TRANSPORTATION AND NOISE, EPA WILL WORK WITH LOCAL OFFICIALS TO ENSURE A SAFE AND EXPEDIENT TRANSPORT OPERATION.

NOISE POLLUTION WOULD BE A NUISANCE TO NEARBY RESIDENTS DUE TO THE 24 HOUR A DAY OPERATIONS. SEVERAL RESIDENTS LIVE APPROXIMATELY 1000 FEET FROM THE MCIVER DUMP AREA, WHILE THERE ARE NO RESIDENTS WITHIN 0.2 MILES OF THE FAIRWAY SIX AREA.

#### TRANSPORTATION AND STORAGE

THE CONTAMINATED SOIL AT EACH OF THE AREAS MEETS EPA'S CRITERIA IN DETERMINING WHETHER A CERCLA WASTE IS A HAZARDOUS WASTE. THE CONTAMINATED SOIL IS A RCRA CHARACTERISTIC WASTE BECAUSE OF ITS TOXICITY. IT IS SUSPECTED THAT ACUTE HAZARDOUS WASTE MAY BE FOUND DURING EXCAVATION. IF ANY CONTAINERS ARE DISCOVERED DURING EXCAVATION OR SAMPLING WHICH EVIDENCE AN ACUTE HAZARDOUS WASTE IDENTIFIED IN 40 CFR SS 261.31, 261.32, OR 261.33(E), THEN THE CONTAMINATED MATERIAL FROM THAT AREA WILL BE TREATED AS A RCRA-LISTED WASTE AND SUBJECT TO DELISTING REQUIREMENTS, A TREATABILITY VARIANCE OR AN ARAR WAIVER DURING THE REMEDIAL ACTION.

WHEN THE RCRA WASTE IS EXCAVATED AND MOVED OUT OF ITS AREA OF CONTAMINATION (AOC) FOR TREATMENT, PLACEMENT WILL OCCUR AND RCRA'S LAND DISPOSAL RESTRICTIONS BECOME APPLICABLE. TRANSPORTATION OF THE SITE HAZARDOUS WASTE FROM ONE AREA TO ANOTHER WILL BE SUBJECT TO RCRA MANIFEST REQUIREMENTS.

RCRA STORAGE REQUIREMENTS OF HAZARDOUS WASTE PRIOR TO TREATMENT ARE APPLICABLE AT THIS SITE. TEMPORARY STORAGE OF WASTE RESIDUALS AFTER TREATMENT WILL ALSO BE REQUIRED UNTIL THE WASTE RESIDUALS ARE DELISTED AS A RCRA HAZARDOUS WASTE AND/OR THE TOXIC CHARACTERISTIC IS REMOVED FROM THE WASTE.

#### TREATMENT TECHNOLOGY OF CONTAMINATED SOIL AND OFF-GASES

THE TREATMENT TECHNOLOGY SELECTED FOR REMEDIATION OF PESTICIDE CONTAMINATED SOILS IS THERMAL DESORPTION WHICH WILL BE IMPLEMENTED ON THE SITE AT THE SELECTED CENTRALIZED LOCATION. THE THERMAL DESORPTION TECHNOLOGY WAS DISCUSSED IN DETAIL IN SECTION 7 OF THIS DOCUMENT.

THERMAL DESORPTION IS AN INNOVATIVE TREATMENT TECHNOLOGY WHICH UTILIZES INDIRECT HEAT TO VOLATILIZE THE ORGANIC CONTAMINANTS FROM THE SOIL. THE CONTAMINANTS ARE CAPTURED IN AN OFF-GAS AND ARE FURTHER TREATED TO PERMANENTLY DESTROY THE TOXIC CONTAMINANTS. OFF-GAS TREATMENT VARIES DEPENDING ON THE VENDOR, BUT USUALLY CONSISTS OF EITHER: (1) THERMAL OXIDATION IN A THERMAL OXIDATION CHAMBER SIMILAR TO INCINERATORS; (2) CONDENSING AND CONCENTRATING THE ORGANICS INTO A SIGNIFICANTLY SMALLER MASS FOR FURTHER TREATMENT (INCINERATION); OR (3) PASSING THE OFF GASES THROUGH ACTIVATED CARBON TO ADSORB THE CONTAMINANTS AND THEN REGENERATING THE CARBON. THIS RECORD OF DECISION AND ROD AMENDMENT WILL NOT SELECT THE OFF-GAS TREATMENT SO AS NOT TO LIMIT VENDOR COMPETITION. HOWEVER, EPA WILL REVIEW AND APPROVE THE SECONDARY TREATMENT PRIOR TO IMPLEMENTATION. STANDARDS FOR THE OPERATION OF HAZARDOUS WASTE INCINERATORS ARE RELEVANT AND APPROPRIATE REQUIREMENTS FOR THERMAL DESORPTION UNIT.

#### TREATMENT GOALS

THE TREATMENT GOALS FOR THE SITE ARE RCRA LAND DISPOSAL RESTRICTION (LDR) STANDARDS. BECAUSE THE LDR TREATMENT STANDARDS ARE BASED ON TREATING LESS COMPLEX MATRICES OF INDUSTRIAL PROCESS WASTES, THE SELECTED REMEDY WILL COMPLY WITH THE LDRS THROUGH A TREATABILITY VARIANCE FOR THE CONTAMINATED SOIL AND DEBRIS. THIS VARIANCE DOES NOT REMOVE THE REQUIREMENT TO TREAT RESTRICTED SOIL AND DEBRIS WASTES, RATHER IT ALLOWS ALTERNATE TREATMENT LEVELS BASED ON DATA FROM ACTUAL TREATMENT OF SOIL, OR BEST MANAGEMENT PRACTICES FOR DEBRIS. THESE LEVELS BECOME THE TREATMENT STANDARD THAT MUST BE MET.

TABLE 30 IDENTIFIES ALTERNATE TREATABILITY VARIANCE LEVELS WHICH MUST BE ATTAINED. A PERCENT REDUCTION OF ORGANIC SITE CONTAMINANTS MUST BE REDUCED TO BETWEEN 90 - 99.99 PERCENT DEPENDING ON THE STRUCTURAL/FUNCTIONAL GROUP OR GROUPS APPLICABLE TO THE SITE. VERIFICATION TESTING USING THE TOXIC CHARACTERISTIC LEACHING PROCEDURE (TCLP) MUST BE PERFORMED TO DEMONSTRATE THAT THE RCRA WASTE IS NO LONGER CHARACTERISTIC FOR THE ORGANIC CONSTITUENTS.

TREATMENT GOALS ARE NOT EXPECTED TO BE LESS THAN TOTAL PESTICIDE CONCENTRATIONS TYPICAL OF BACKGROUND CONCENTRATIONS IN THE ABERDEEN AREA. FURTHER SURFACE SOIL SAMPLING IN THE ABERDEEN AREA, AS WELL AS IN THE VICINITY OF EACH AREA IS REQUIRED TO BETTER DEFINE TRUE BACKGROUND PESTICIDE CONCENTRATIONS.

ALTHOUGH INORGANIC CONSTITUENTS ARE NOT THE PRIMARY CONTAMINANTS OF CONCERN AT THE SITE, THERE ARE LOCALIZED HOT SPOTS WITH ELEVATED METAL CONTAMINATION. THESE AREAS WILL BE SEGREGATED BEFORE AND AFTER TREATMENT. SAMPLE COLLECTION AND ANALYSIS WILL BE THE SAME AS DISCUSSED ABOVE FOR THE INORGANIC CONSTITUENTS. IF THE TREATMENT RESIDUALS DO NOT MEET THE ALTERNATE TREATABILITY VARIANCE LEVELS AS IDENTIFIED IN TABLE 30, FURTHER TREATMENT THROUGH REPROCESSING IN THE THERMAL DESORBER OR INCINERATOR, OR IMMOBILIZATION (FIXATION/SOLIDIFICATION/STABILIZATION) WILL BE REQUIRED IN ORDER TO MEET TREATMENT GOALS PRIOR TO ON-SITE DISPOSAL OF THE TREATMENT RESIDUE.

THE BEST DEMONSTRATED AVAILABLE TECHNOLOGY USED TO SET OR MEET LDR STANDARDS AT THE SITE IS INCINERATION. A TREATABILITY VARIANCE DOES NOT UNNECESSARILY RESTRICT THE DEVELOPMENT AND USE OF AN ALTERNATE AND INNOVATIVE TREATMENT TECHNOLOGY, THERMAL DESORPTION, FOR REMEDIATING THE SITE. INCINERATION, THE CONTINGENCY REMEDY, WILL BE IMPLEMENTED IF THERMAL DESORPTION FAILS TO MEET THE TREATMENT GOALS.

#### DELISTING OF RCRA HAZARDOUS WASTE

ONCE A WASTE IS IDENTIFIED AS A RCRA HAZARDOUS WASTE AND IT IS MOVED OUT OF THE AOC FOR TREATMENT, IT MUST BE HANDLED AS A HAZARDOUS WASTE EVEN AFTER TREATMENT BASED ON THE DERIVED-FROM RULE {40 CFR S 261.3(C)(2)}. WASTE TO BE DELISTED MUST BE MANAGED AS HAZARDOUS UNTIL IT HAS BEEN ANALYZED IN ACCORDANCE WITH SAMPLING AND ANALYSIS REQUIREMENTS.

DELISTING OF A HAZARDOUS WASTE REQUIRES A DEMONSTRATION THAT A LISTED RCRA HAZARDOUS WASTE NO LONGER MEETS ANY OF THE CRITERIA UNDER WHICH THE WASTE WAS LISTED AND NO OTHER FACTORS ARE KNOWN THAT WOULD MAKE THE WASTE HAZARDOUS. FOR ON-SITE CERCLA REMEDIAL RESPONSE ACTIONS, DELISTING IS ACCOMPLISHED BY INCORPORATING THE SUBSTANTIVE REQUIREMENTS OF 40 CFR SS 260.20 AND 260.22 INTO THE REMEDIAL PROCESS. TO DEMONSTRATE COMPLIANCE, VERIFICATION TESTING WILL BE REQUIRED FOLLOWING TREATMENT OF THE WASTES TO CONFIRM THAT DELISTING LEVELS ARE ATTAINED. VERIFICATION TESTING WILL BE COLLECTION OF SAMPLES OF THE TREATMENT RESIDUALS AND ANALYSIS OF THOSE SAMPLES FOR TOTAL AND TCLP LEACHATE CONCENTRATIONS OF ORGANIC CONSTITUENTS. IN ADDITION, ONCE SUFFICIENT DATA ARE COLLECTED ON THE WASTE AND ITS POTENTIAL FATE AND TRANSPORT, MODELS ARE RUN TO EVALUATE THE DILUTION AND ATTENUATION OF CONSTITUENTS AT A HYPOTHETICAL RECEPTOR WELL. THE CALCULATED CONCENTRATIONS OF CONSTITUENTS AT THE HYPOTHETICAL RECEPTOR WELL MUST AT LEAST MEET THE HEALTH-BASED LEVELS USED FOR DELISTING DECISIONS FOR THE WASTE TO BE SUCCESSFULLY DELISTED.

TABLE 31 IDENTIFIES THE MAXIMUM ALLOWED CONCENTRATIONS FOR SPECIFIC CONSTITUENTS BASED ON THE CURRENT HEALTH-BASED LEVELS (10-6 RISK). IF A RCRA-LISTED WASTE IS IDENTIFIED AND SUFFICIENT DATA IS COLLECTED TO INDICATE THAT TREATMENT WILL ATTAIN DELISTING LEVELS, THE AGENCY WILL SEEK TO DELIST THE WASTE THROUGH AN EXPLANATION OF SIGNIFICANT DIFFERENCES (ESD) OR ROD AMENDMENT. THE DELISTING WILL BE GRANTED WHEN THE REGIONAL ADMINISTRATOR SIGNS THE ESD OR ROD AMENDMENT.

#### DISPOSAL OF TREATMENT RESIDUALS

WHEN THE TREATMENT GOALS ARE ATTAINED, AND THE LISTED WASTE RESIDUALS ARE DELISTED, THE RESIDUALS WILL BE TRANSPORTED AND REDEPOSITED IN THE AREA WHERE THEY ORIGINATED. THE AREAS WILL BE BACKFILLED WITH FILL MATERIAL, GRADED AND PLANTED WITH VEGETATION WHICH MOST CLOSELY MIMICS THAT FOUND IN THE NATURAL SUCCESSION STAGES FOR THAT AREA. REVEGETATION SHOULD CONSIST OF NATIVE PIONEERING SPECIES OF GRASSES AND FORBS WHICH WOULD NORMALLY INVADE BARE AREAS, OR POSSIBLY PINE TREES WHICH WOULD NATURALLY INVADE ABANDONED FIELDS.

## IDENTIFICATION OF HAZARDOUS WASTE SITE

ALL AREAS OF THE SITE SHALL HAVE FENCES AND PROPER WARNING SIGNS POSTED IN A VISIBLE LOCATION IN ORDER TO PROVIDE SITE CONTROL WHERE HUMANS HAVE ACCESS TO THE RELEASE.

### 9.2 ELEMENTS UNIQUE TO EACH AREA

THE SELECTED REMEDY INVOLVES ELEMENTS WHICH ARE UNIQUE TO CERTAIN AREAS OF THE SITE AND ARE DISCUSSED BELOW BY AREA.

#### FARM CHEMICALS AREA

THE FARM CHEMICALS AREA HAS 11 BUILDINGS AND 3 ABOVE GROUND TANKS WITHIN ITS BOUNDARY. SOME OR ALL OF THE BUILDINGS/STRUCTURES AT THIS AREA SHOULD BE DEMOLISHED AND REMOVED TO FACILITATE THE REMEDIATION OF CONTAMINATED SOILS. SOIL SAMPLES COLLECTED NEAR THE FOUNDATIONS OF SEVERAL OF THE BUILDINGS CONTAINED VERY ELEVATED LEVELS OF PESTICIDES; THE FOUNDATIONS MAY ALSO BE CONTAMINATED. THESE FOUNDATIONS PROBABLY WOULD BE UNDERMINED DURING EXCAVATION. IN ADDITION, THREE PIPE INSULATION SAMPLES COLLECTED IN AND AROUND BUILDINGS 17 AND 19 (SEE FIGURE 2 IN SECTION 1.0 OF THIS REPORT) CONTAINED 40 PERCENT, 20 PERCENT, AND 37 PERCENT OF ASBESTOS. PROPER PROCEDURES MUST BE FOLLOWED IN REMOVING AND DISPOSING OF THE ASBESTOS-CONTAINING PIPE INSULATION BEFORE DESTRUCTION OF THE SOUTHERNMOST WAREHOUSE.

THE BUILDING DEBRIS WILL BE SUBJECT TO RCRA CHARACTERISTIC HAZARDOUS WASTE TESTING; IF FOUND NON-HAZARDOUS, IT MAY BE DISPOSED OF IN THE NEAREST MUNICIPAL LANDFILL. IF IT IS FOUND HAZARDOUS BECAUSE OF HALOGENATED ORGANIC COMPOUND (HOC) CONTAMINATION, A TREATABILITY VARIANCE FOR THIS MATERIAL WILL APPLY BEST MANAGEMENT PRACTICES. THE TREATMENT STANDARD REQUIRED BY THE LDRS FOR THE HOC CONTAMINATION PRESENT AT THE FARM CHEMICALS AREA IS INCINERATION. THIS IS AN INAPPROPRIATE TREATMENT TECHNOLOGY FOR BUILDING DEBRIS, THUS TRIGGERING THE NEED FOR THE TREATABILITY VARIANCE. IN THIS CASE, BEST MANAGEMENT PRACTICES, SUCH AS DECONTAMINATION OR DESTRUCTION, WILL BE EMPLOYED WHICH LOWER CONTAMINATION TO THE ALTERNATE TREATMENT LEVELS OF THE TREATABILITY VARIANCE. THE MATERIAL WILL THEN BE SUITABLE FOR LAND DISPOSAL.

CONTAINERS CONSISTING OF SEVERAL 55-GALLON DRUMS, 1-GALLON CONTAINERS, AND 5-GALLON BUCKETS ARE LOCATED WITHIN SEVERAL BUILDINGS ON THE AREA. ANY TANK/DRUMS/BUCKETS CONTAINING PESTICIDES OR VOLATILE OR SEMIVOLATILE ORGANIC COMPOUNDS MUST BE DECONTAMINATED PRIOR TO OFF-SITE DISPOSAL OF THE SOLID WASTE. THE HAZARDOUS WASTE RESULTING FROM THE DECONTAMINATION PROCESS WILL BE COLLECTED, STORED AND THEN TREATED IN THE THERMAL DESORBER UNIT WHEN IT IS IN FULL SCALE OPERATION.

A STAINED LOCATION NEAR SURFICIAL SOIL SAMPLE 119 CONTAINED VERY ELEVATED LEVELS OF SEVERAL METALS. THIS LOCATION MUST BE FURTHER CHARACTERIZED AND SEGREGATED DURING EXCAVATION AND THERMAL TREATMENT TO MINIMIZE THE NEED FOR SECONDARY TREATMENT DUE TO METAL TOXICITY IN THE TREATMENT RESIDUALS. ANY AREA ON THE SITE FOUND TO CONTAIN ELEVATED LEVELS OF METALS SHOULD BE HANDLED AND TREATED IN THE SAME MANNER.

THE REMEDIAL INVESTIGATION IDENTIFIED POTENTIAL OR SUSPECTED TRENCH AREAS AT THE SITE AREA WHICH MAY NOT BE CONTAINED WITHIN THE FARM CHEMICALS, INC. PLANT PROPERTY. FURTHER SAMPLING IS NEEDED TO CONFIRM THE PRESENCE OF BURIED TRENCHES AND THEN TO FULLY CHARACTERIZE THE VERTICAL AND LATERAL EXTENT OF CONTAMINATION.

#### TWIN SITES AREA

GEOPHYSICAL SURVEY RESULTS IDENTIFIED SIX SUSPECTED TRENCH AREAS. SEVERAL OF THESE TRENCHES COINCIDE WITH AREAS OF HIGHLY CONTAMINATED SURFICIAL SOIL SAMPLES. ADDITIONAL SAMPLING IS NEEDED TO CONFIRM THE PRESENCE OF BURIED TRENCHES AND THEN TO FULLY CHARACTERIZE THE VERTICAL AND LATERAL EXTENT OF CONTAMINATION. IF THE POTENTIAL TRENCH AREAS ARE CONFIRMED, UP TO AN ADDITIONAL 52,360 YD<sup>3</sup> OF MATERIAL WOULD REQUIRE THERMAL TREATMENT.

FENCING AROUND THIS AREA IS REQUIRED TO PROVIDE AREA CONTROL PRECAUTIONS WHERE HUMANS OR ANIMALS HAVE ACCESS TO THE RELEASE. BARRIERS SHOULD BE CONSTRUCTED WHERE SEVERE EROSION IS CURRENTLY

OCCURRING TO PREVENT FURTHER CONTAMINATION OF THE AQUATIC SYSTEMS FROM THE EROSION OF CONTAMINATED SOIL PARTICLES.

#### FAIRWAY SIX AREA

THE REMEDIAL INVESTIGATION GEOPHYSICAL SURVEYS INDICATE THAT AS MANY AS SEVEN ADDITIONAL TRENCHES MAY BE LOCATED AT THIS AREA. FURTHER SAMPLING IS NEEDED TO CONFIRM THE PRESENCE OF BURIED TRENCHES AND THEN TO FULLY CHARACTERIZE THE VERTICAL AND LATERAL EXTENT OF CONTAMINATION. IF THE POTENTIAL TRENCH AREAS ARE CONFIRMED, UP TO AN ADDITIONAL 60,320 YD3 OF MATERIAL WOULD REQUIRE THERMAL TREATMENT.

#### MCIVER DUMP AREA

THE MAIN AREA OF CONTAMINATION IS LOCATED TO THE NORTHWEST OF THE KNOWN AREA OF CONTAMINATION, AREA B. FURTHER SAMPLING IS NEEDED TO FULLY CHARACTERIZE THE VERTICAL AND HORIZONTAL EXTENT OF CONTAMINATION NORTHWEST OF AREA B.

AREA C WAS EXCAVATED BY EPA'S EMERGENCY RESPONSE TEAM IN 1989. THIS MATERIAL IS STOCKPILED ON-SITE AND WAS INCLUDED IN THE VOLUME OF SOIL REQUIRING TREATMENT AT THE MCIVER DUMP AREA. ADDITIONAL SAMPLING IS NEEDED TO FULLY CHARACTERIZE THE LATERAL AND VERTICAL EXTENT OF RESIDUAL CONTAMINATION IN AREA C. THE CLEANUP OR EXCAVATION GOALS FOR MCIVER DUMP AREAS B AND C ARE IDENTIFIED IN TABLE 29. ANY RESIDUAL CONTAMINATION EXCEEDING THE CLEANUP GOALS IDENTIFIED IN TABLE 29 WILL BE EXCAVATED AND THERMALLY TREATED.

BARRIERS SHOULD BE CONSTRUCTED WHERE SEVERE EROSION IS CURRENTLY OCCURRING TO PREVENT FURTHER CONTAMINATION OF THE AQUATIC SYSTEMS FROM THE EROSION OF CONTAMINATED SOIL PARTICLES.

#### ROUTE 211 AREA

MERCURY WAS DETECTED AT A VERY ELEVATED LEVEL IN ONE SOIL SAMPLE. ADDITIONAL SAMPLING IS NEEDED TO CONFIRM AND DELINEATE THE EXTENT OF THIS CONTAMINATION. AREAS CONTAINING ELEVATED METAL CONTAMINATION MUST BE SEGREGATED DURING HANDLING AND TREATMENT TO MINIMIZE THE POTENTIAL FOR SECONDARY TREATMENT.

### 9.3 CONTINGENCY FOR SOILS REMEDIATION

A CONTINGENCY ROD IS APPROPRIATE WHEN THE PERFORMANCE OF AN INNOVATIVE TREATMENT TECHNOLOGY APPEARS TO BE THE MOST PROMISING OPTION, BUT ADDITIONAL TESTING WILL BE NEEDED DURING REMEDIAL DESIGN TO VERIFY THE TECHNOLOGY'S PERFORMANCE CAPABILITIES; IN THIS CASE, A MORE "PROVEN APPROACH" IS IDENTIFIED AS A CONTINGENCY REMEDY.

SHOULD IMPLEMENTATION OF THE THERMAL DESORPTION METHOD (ALTERNATIVE 7) PROVE INEFFECTIVE FOR REMEDIATION OF SOILS BY NOT MEETING SOIL TREATMENT LEVELS, ALTERNATIVE 4, OPTION 1 WILL BE IMPLEMENTED AS THE AGENCY'S CONTINGENCY ALTERNATIVE. ALL ASPECTS OF ALTERNATIVE 4, OPTION 1 ARE IDENTICAL TO THOSE OF ALTERNATIVE 7, EXCEPT THAT CONTAMINATED SOILS WOULD BE REMEDIATED USING ON-SITE INCINERATION.

THE CRITERIA THAT EPA WILL USE TO DECIDE TO IMPLEMENT THE CONTINGENCY OPTION INSTEAD OF THE SELECTED REMEDY ARE:

- FAILURE TO MEET TREATABILITY VARIANCE LEVELS IDENTIFIED IN TABLE 30 OR FAILURE TO MEET LEVELS REQUIRED FOR REDEPOSITORY MATERIAL AT THE INDIVIDUAL AREAS AS DESCRIBED IN SECTION 9.1;
- FAILURE TO MEET TCLP REQUIREMENTS; OR
- SIGNIFICANT COST INCREASE FOR THERMAL DESORPTION WHICH WOULD EXCEED THE COST OF ON-SITE INCINERATION.

ALL COMPONENTS OF THE CONTINGENCY REMEDY, ALTERNATIVE 4, OPTION 1 ARE THE SAME AS THE SELECTED REMEDY, ALTERNATIVE 7, WITH THE EXCEPTION OF THE TREATMENT TECHNOLOGY, INCINERATION. UNDER

ALTERNATIVE 4, OPTION 1, CONTAMINATED SOIL AND DEBRIS ARE INCINERATED ON-SITE IN A CENTRALIZED MOBILE INCINERATOR. FOR COST ESTIMATION, A MOBILE ROTARY KILN INCINERATOR WAS ASSUMED DUE TO THEIR RELATIVE ABUNDANCE AND AVAILABILITY. HOWEVER, OTHER TYPES OF INCINERATORS THAT PROVIDE EQUAL OR BETTER PERFORMANCE SHOULD BE CONSIDERED WHEN BIDDING THE PROJECT. THIS ALTERNATIVE CONSISTS OF THE FOLLOWING REMEDIAL ACTIVITIES:

- MOBILIZING THE INCINERATOR IN A CENTRALIZED LOCATION (FAIRWAY SIX AREA);
- EXCAVATING PESTICIDE CONTAMINATED MATERIAL FROM EACH AREA OF THE SITE;
- TRANSPORTING THE MATERIAL TO THE CENTRALIZED LOCATION;
- HOMOGENIZING AND SIZING THE MATERIAL FOR INCINERATION;
- INCINERATING THE WASTE;
- ON-SITE TREATMENT OF PROCESS WASTEWATER OR SCRUBBER BLOWDOWN SLUDGE BY REINJECTION INTO THE INCINERATOR, OR ON-SITE TREATMENT AND DISCHARGE, IN ACCORDANCE WITH A NPDES PERMIT; AND
- DEMOBILIZATION.

PRIOR TO INCINERATION, THE MATERIAL WILL BE PASSED THROUGH A SHREDDER AND POWER-SCREENS FOR SIZING. THE PROPERLY SIZED CONTAMINANTS WILL THEN BE FED INTO THE INCINERATION UNIT. IN ORDER TO MAINTAIN A READILY AVAILABLE FEED FOR THE INCINERATOR A "WASTE PILE" MUST BE MAINTAINED ON-SITE. THIS WASTE PILE WILL CONSTITUTE PLACEMENT UNDER RCRA. THEREFORE, IT WILL HAVE TO COMPLY WITH RCRA REGULATIONS AS SPECIFIED IN 40 CFR S 265 SUBPART L. OPERATION OF THE INCINERATION UNIT WILL BE IN COMPLIANCE WITH RCRA REGULATIONS (PARTICULARLY 40 CFR S 264 SUBPART O), INCLUDING PERFORMANCE STANDARDS. THE INCINERATOR AND AIR POLLUTION CONTROL UNIT WILL BE OPERATED SO THAT:

AN OPERATING TEMPERATURE IN THE KILN OF 1,800 DEGREE FAHRENHEIT IS MAINTAINED AT ALL TIMES TO ENSURE THAT ANY VOLATILE AND SEMI-VOLATILE ORGANIC CONSTITUENTS IN THE WASTE STREAM ARE DRIVEN OUT OF THE ASH AND THAT THE FIXED CARBON REMAINING IN THE ASH IS MINIMIZED;

AN OPERATING TEMPERATURE IN THE AFTERBURNER OF 2,000 DEGREE FAHRENHEIT IS MAINTAINED AT ALL TIMES TO OXIDIZE AND DESTROY ALL REMAINING ORGANIC SUBSTANCES PRIOR TO EXITING THE AFTERBURNER AND ENTERING THE POLLUTION CONTROL SYSTEM;

THE INCINERATOR WILL ACHIEVE A DESTRUCTION AND REMOVAL EFFICIENCY (DRE) OF 99.99 PERCENT FOR ALL DESIGNATED PRINCIPAL ORGANIC HAZARDOUS CONSTITUENTS (POHC); AND

THE AIR POLLUTION CONTROL SYSTEM WILL ACHIEVE PERFORMANCE STANDARDS OF (1) HYDROGEN CHLORIDE OF LESS THAN 4 POUNDS/HOUR AND (2) PARTICULATE MATTER OF LESS THAN 0.08 GRAINS PER DRY FT<sup>3</sup> IN THE EXHAUST GAS CORRECTED TO A 7 PERCENT OXYGEN CONTENT.

EXCESS QUENCHING AND SCRUBBER WATER, IF ANY, WILL BE REINJECTED INTO THE INCINERATOR FOR DISPOSAL. AIR POLLUTION CONTROL WASTES OR SLUDGES WILL BE REINJECTED IN THE INCINERATOR FOR FURTHER TREATMENT. INCINERATOR ASH WILL BE COLLECTED, TESTED FOR RCRA CHARACTERISTICS, TREATED AS NECESSARY TO REMOVE ANY HAZARDOUS CHARACTERISTICS AND WERE TRANSPORTED BACK TO THE AREA FROM WHERE IT ORIGINATED FOR ON-SITE DISPOSAL.

ALTERNATIVE 4, OPTION 1, LIKE ALTERNATIVE 7, UTILIZES A THERMAL TREATMENT TO REMEDIATE CONTAMINATED SITE SOILS, BUT ALTERNATIVE 4 WOULD INVOLVE THE USE OF AN ON-SITE INCINERATOR WHICH WOULD DESTROY THE ORGANICS PRESENT IN SITE SOILS RATHER THAN CAUSE A PHYSICAL SEPARATION OF ORGANICS FROM THE SOILS BY THE THERMAL DESORPTION TECHNOLOGY. THE USE OF THERMAL TREATMENT OF SOILS WILL ENSURE THAT CONTAMINANT LEVELS ARE PERMANENTLY REDUCED, THUS ELIMINATING A CURRENT SOURCE OF GROUNDWATER CONTAMINATION. TABLE 32 PROVIDES A COST SUMMARY FOR ALTERNATIVE 4, OPTION 1.



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## 10.0 AMENDMENT TO FORMER OPERABLE UNIT TWO RECORD OF DECISION

### 10.1 INTRODUCTION

THE FAIRWAY SIX DISPOSAL SITE, FORMER OPERABLE UNIT TWO, BUT HEREAFTER REDESIGNATED AS OPERABLE UNIT FOUR, IS LOCATED ADJACENT TO THE SIXTH FAIRWAY OF THE PIT GOLF LINKS IN ABERDEEN, NORTH CAROLINA. ON JUNE 30, 1989 THE EPA REGION IV ADMINISTRATOR SIGNED A RECORD OF DECISION FOR OU FOUR. OU FOUR IS CURRENTLY AN ENFORCEMENT LEAD SITE WITH EPA, THE LEAD AGENCY, PROVIDING OVERSIGHT OF SITE ACTIVITIES. THIS AMENDMENT IS BEING PROVIDED IN ACCORDANCE WITH CERCLA S 117(C) AND THE NATIONAL CONTINGENCY PLAN (NCP) 40 CFR S 300.435(C)(2)(II). THE AMENDMENT WILL BECOME PART OF THE ADMINISTRATIVE RECORD FILE (NCP 40 CFR S 300.825(A)(2)) FOR OU FOUR (FORMER OU TWO) AND OU ONE, WHICH IS LOCATED AT THE SITE REPOSITORY. THE SITE REPOSITORY IS LOCATED AT THE ABERDEEN TOWN HALL, 115 NORTH POPLAR STREET, ABERDEEN, NORTH CAROLINA. THE TELEPHONE NUMBER IS 919-944-1115. HOURS OF OPERATION ARE MONDAY THROUGH FRIDAY, 8:00 A.M. - 5:00 P.M.

THE FAIRWAY SIX AREA WAS ONE OF AT LEAST FOUR AREAS USED AS A DISPOSAL LOCATION IN ABERDEEN, NC. THIS AREA WAS USED AS A TRASH DUMP BY TAYLOR CHEMICAL CO. AND GROWER SERVICE CO. FOR MANY YEARS PRIOR TO THE CONSTRUCTION OF THE PIT GOLF LINKS GOLF COURSE IN 1984. AFTER AN INVESTIGATION BY EPA'S EMERGENCY RESPONSE SECTION IN 1985 AND 1986, TWO REMOVAL ACTIONS WERE CONDUCTED AT THIS AREA. THE FIRST REMOVAL ACTION CONDUCTED IN 1985 RESULTED IN THE EXCAVATION AND OFF-SITE DISPOSAL OF 1,420 TONS OF PESTICIDE CONTAMINATED SOIL AND WASTE. THE SECOND REMOVAL CONDUCTED IN 1988 RESULTED IN THE EXCAVATION OF 22,000 CY OF PESTICIDE LADEN SOIL AND WASTE. THIS MATERIAL WAS STOCKPILED ON THE FAIRWAY SIX AREA AND COVERED WITH A TOP AND BOTTOM PVC LINER. THAT STOCKPILE COMPRISES WHAT IS NOW DESIGNATED AS OU FOUR.

### 10.2 REASONS FOR ISSUING THE ROD AMENDMENT

THE SELECTED REMEDY INVOLVED ON-SITE INCINERATION OF THE STOCKPILED MATERIAL, CONFIRMATORY ANALYSIS OF INCINERATOR ASH AND ON-SITE DISPOSAL OF NON-HAZARDOUS INCINERATOR ASH.

FOLLOWING EPA'S ISSUANCE OF A CERCLA SECTION 106 (AMENDED) UNILATERAL ADMINISTRATIVE ORDER IN MARCH 1990, UNION CARBIDE CORPORATION (UCC), AGREED TO IMPLEMENT THE REMEDY AT OU FOUR. A REMEDIAL ACTION (RA) WORK PLAN WAS PREPARED IN SEPTEMBER 1990. UCC'S SAMPLING OF THE CONTAMINATED SOILS IN THE STOCKPILE PURSUANT TO THE RA WORKPLAN CONFIRMED THE PRESENCE OF SEVIN AND OTHER PESTICIDES. ON SEPTEMBER 19, 1990, UNION CARBIDE CORPORATION MADE A REQUEST THAT EPA POSTPONE IMPLEMENTATION OF OU FOUR UNTIL A REMEDY WAS SELECTED FOR OU ONE. THE PURPOSE OF UNION CARBIDE'S PROPOSAL WAS TO ANALYZE THE VIABILITY OF COMBINING OU ONE AND OU FOUR AND SUBSEQUENTLY UTILIZE ONE TREATMENT TECHNOLOGY AT A SINGLE LOCATION. AFTER EVALUATION OF UNION CARBIDE'S REQUEST, EPA ALLOWED THE EXTENSION OF THE IMPLEMENTATION SCHEDULE FOR OU FOUR FOR THE FOLLOWING REASONS:

- IDENTIFICATION OF APPROPRIATE CLEANUP GOALS NOT EXPLICITLY DEFINED IN THE FORMER OU TWO ROD;
- POTENTIAL COST SAVINGS IF INCINERATION WERE THE SELECTED REMEDY FOR OU ONE AND THE OPERABLE UNITS WERE IMPLEMENTED SIMULTANEOUSLY;
- UNION CARBIDE'S AGREEMENT TO TAKE MEASURES FOR THE PREVENTION OF ANY ENVIRONMENTAL HARM RESULTING FROM THE CONTINUED EXISTENCE OF THE STOCKPILED MATERIAL AT THE FAIRWAY SIX AREA; AND
- UNION CARBIDE'S AGREEMENT TO PARTICIPATE IN NEGOTIATIONS FOR OU ONE.

THE MAY 1991 FEASIBILITY STUDY FOR OU ONE SUPPORTS THE PROPOSAL THAT REMEDY IMPLEMENTATION SHOULD BE CONDUCTED AT ONE CENTRAL LOCATION. THIS IS SUBSTANTIATED BY THE ECONOMIC IMPRACTICABILITY OF CONDUCTING REMEDIATION AT EACH INDIVIDUAL AREA. THEREFORE, THIS RATIONAL ALSO SUPPORTS COMBINING REMEDIATION FOR OU FOUR (FORMER OU TWO) WITH OU ONE. THE REVISED REMEDY COST OF \$4.3 MILLION INVOLVES TREATMENT OF CONTAMINATED SOIL AND DEBRIS UTILIZING THERMAL DESORPTION FOR THE FAIRWAY SIX AREA STOCKPILE.

BOTH TECHNOLOGIES, INCINERATION AND THERMAL DESORPTION, UTILIZE THERMAL TREATMENT WHICH APPLIES AN ELEVATED TEMPERATURE AS THE PRIMARY MEANS TO CHANGE THE CHEMICAL, PHYSICAL, OR BIOLOGICAL

CHARACTER OR COMPOSITION OF THE HAZARDOUS WASTE. INCINERATION IS A TECHNOLOGY WHICH UTILIZES COMBUSTION THROUGH OXIDATION TO DESTROY THE ORGANIC CONTAMINANTS. OFF GASES FROM THE COMBUSTION PROCESS ARE EMITTED INTO THE ATMOSPHERE FOLLOWING AN AIR POLLUTION CONTROL TRAIN. THERMAL DESORPTION ON THE OTHER HAND ONLY VOLATILIZES THE ORGANIC CONTAMINANTS FROM THE SOIL AND THE OFF-GASES ARE CAPTURED FOR FURTHER TREATMENT. THERMAL DESORPTION ELIMINATES THE OFF-GAS EMISSIONS INTO THE ATMOSPHERE.

FUNDAMENTAL DIFFERENCES TO THE ROD FOR OU FOUR ARE PRESENTED BELOW.

#### ORIGINAL REMEDY

#### MODIFIED REMEDY

INCINERATION OF 22,000 CY OF

THERMAL DESORPTION OF 22,000 CY OF CONTAMINATED SOIL. SOIL WITH INCINERATION AS A CONTINGENCY REMEDY.

PERFORMANCE STANDARDS IDENTIFIED AS ELIMINATION OF TOXIC CHARACTERISTICS (USING THE EP TOXICITY TEST) AND CONFORMITY TO BACKGROUND LEVELS DETERMINED TO BE 2.3 PPM TOTAL PESTICIDES.

PERFORMANCE STANDARDS ARE IDENTIFIED AS ELIMINATION OF TOXIC CHARACTERISTICS (USING THE TCLP TEST) AND CONFORMITY TO CLEANUP LEVELS ESTABLISHED FOR FAIRWAY SIX AREA IDENTIFIED IN THIS ROD FOR OU ONE.

NC ROD CONCURRENCE IDENTIFIED PERFORMANCE STANDARDS BASED ON TCLP TO DRINKING WATER STANDARDS

THE WASTE WILL BE TREATED TO MEET TO MEET RCRA REQUIREMENTS, BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT) REQUIREMENTS OR OBTAIN A TREATABILITY VARIANCE.

NO HAZARDOUS PROCESS RESIDUALS RESULT FROM THE INCINERATOR TECHNOLOGY

HAZARD PROCESS RESIDUALS RESULTING FROM THE THERMAL DESORPTION TECHNOLOGY WILL REQUIRE TREATMENT WHICH WILL BE VENDOR SPECIFIC.

ESTIMATED PRESENT WORTH COST FOR ON-SITE INCINERATION IS \$14.5 MILLION.

ESTIMATED PRESENT WORTH COST FOR ON-SITE THERMAL DESORPTION AT THE FAIRWAY SIX AREA IS \$4.3 MILLION

### 10.3 DESCRIPTION OF NEW ALTERNATIVES

THE ORIGINAL SELECTED REMEDY, ON-SITE INCINERATION, AND THE AMENDED REMEDY, ON-SITE THERMAL DESORPTION, ALONG WITH OTHER ALTERNATIVES EVALUATED IN THE FS ARE DESCRIBED IN SECTION 7 OF THE ROD FOR OU ONE.

### 10.4 EVALUATION OF ALTERNATIVES

THE ORIGINAL SELECTED REMEDY, ON-SITE INCINERATION AND THE AMENDED REMEDY, ON-SITE THERMAL DESORPTION, ALONG WITH OTHER ALTERNATIVES EVALUATED IN THE FS ARE PROFILED AGAINST THE NINE CRITERIA IN SECTION 8 OF THE ROD FOR OU ONE.

COST WAS THE ONLY CRITERIA NOT PREVIOUSLY EVALUATED AND DISCUSSED IN SECTION 8 OF THE ROD FOR OU ONE. THE ORIGINAL COST ESTIMATE FOR ON-SITE INCINERATION FOR OU FOUR WAS \$14.5 MILLION. UTILIZING THERMAL DESORPTION AT A CENTRAL LOCATION AND COMBINING OU FOUR WITH OU ONE, THE REVISED COST ESTIMATE TO REMEDIATE THE OU FOUR STOCKPILE IS \$4.3 MILLION.

### 10.5 STATUTORY DETERMINATIONS

CONSIDERING THE NEW INFORMATION THAT HAS BEEN DEVELOPED AND THE CHANGES THAT HAVE BEEN MADE TO

THE SELECTED REMEDY FOR OU FOUR, THE EPA AND NCDEHNR BELIEVE THAT THE REMEDY REMAINS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, COMPLIES WITH FEDERAL AND STATE REQUIREMENTS THAT WERE IDENTIFIED IN THE ROD AS APPLICABLE OR RELEVANT AND APPROPRIATE TO THIS REMEDIAL ACTION (AT THE TIME THE ORIGINAL ROD WAS SIGNED), AND IS COST-EFFECTIVE. IN ADDITION, THE AMENDED REMEDY UTILIZES PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT (OR RESOURCE RECOVERY) TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE FOR THIS SITE.

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## 11.0 THE STATUTORY DETERMINATIONS

UNDER ITS LEGAL AUTHORITIES, EPA'S PRIMARY RESPONSIBILITY AT SUPERFUND SITES IS TO UNDERTAKE REMEDIAL ACTIONS THAT ACHIEVE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT. IN ADDITION, CERCLA SECTION 121 ESTABLISHED SEVERAL OTHER STATUTORY REQUIREMENTS WHICH MUST BE ATTAINED BY THE SELECTED REMEDY (NCP 40 CFR S 300.430(F)(II)A-E). THE STATUTORY REQUIREMENTS SPECIFY THAT THE SELECTED REMEDIAL ACTION FOR THIS SITE MUST MEET ALL OF THE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) OF BOTH FEDERAL AND STATE UNLESS A WAIVER IS JUSTIFIED. THE SELECTED REMEDY ALSO MUST BE COST-EFFECTIVE AND UTILIZE PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE. FINALLY, THE STATUTE INCLUDES A PREFERENCE FOR REMEDIES THAT EMPLOY TREATMENT THAT PERMANENTLY AND SIGNIFICANTLY REDUCE THE VOLUME, TOXICITY, OR MOBILITY OF HAZARDOUS WASTES AS THEIR PRINCIPAL ELEMENT. THE FOLLOWING SECTIONS DISCUSS HOW THE SELECTED AND CONTINGENCY REMEDY MEETS THESE STATUTORY REQUIREMENTS.

### 11.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

THE SELECTED REMEDY AND CONTINGENCY REMEDY PROTECT HUMAN HEALTH AND THE ENVIRONMENT THROUGH THERMAL TREATMENT OF PESTICIDE CONTAMINANTS IN SOIL. THE CONTAMINANTS WILL BE PERMANENTLY REMOVED FROM THE SOIL BY THERMAL DESORPTION OR INCINERATION. THE VOLATILIZED ORGANIC CONTAMINANTS RESULTING FROM THERMAL DESORPTION WILL BE CAPTURED AND PERMANENTLY DESTROYED THROUGH SECONDARY TREATMENT. INCINERATION OF THE CONTAMINATED SOIL WOULD DESTROY THE ORGANICS BY COMBUSTION AND WOULD NOT REQUIRE SECONDARY TREATMENT. TREATED SOILS MUST MEET RCRA LDR STANDARDS (TREATABILITY VARIANCE LEVELS), PASS RCRA HAZARDOUS CHARACTERISTIC TESTING AND, WHERE NECESSARY, MEET RCRA DELISTING REQUIREMENTS. THUS, IMPLEMENTATION OF EITHER ALTERNATIVE, THERMAL DESORPTION OR INCINERATION WOULD PROVIDE SUFFICIENT PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT.

THERMAL TREATMENT OF PESTICIDE CONTAMINATED SOIL WILL ELIMINATE THE THREAT OF EXPOSURE TO THE CONTAMINANTS FROM DIRECT CONTACT WITH OR INGESTION OF CONTAMINATED SOIL. THE FUTURE RISKS ASSOCIATED WITH THESE EXPOSURE PATHWAYS AT EACH AREA FALLS OUTSIDE OF EPA'S PROTECTIVE RISK RANGE,  $1 \times 10^{-4}$ . EXCAVATION OF CONTAMINATED SOIL TO CLEANUP GOALS ESTABLISHED AT  $10^{-6}$  HEALTH BASED LEVELS WILL PROVIDE ADEQUATE PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT. BY EXCAVATING AND TREATING THE CONTAMINATED SOIL TO STRINGENT RCRA STANDARDS, THE SELECTED REMEDY WILL FURTHER PROVIDE PROTECTION TO THE UNDERLYING AQUIFER WHICH IS THE SOLE SOURCE OF DRINKING WATER FOR THE LOCAL COMMUNITY.

### 11.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

THE SELECTED ALTERNATIVE, AS WELL AS THE CONTINGENCY REMEDY, WILL BE DESIGNED TO MEET ALL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) OF FEDERAL AND STATE LAWS. POTENTIAL ACTION-, CHEMICAL-, AND LOCATION-SPECIFIC ARARS TO BE ATTAINED BY THE REMEDIATION OF CONTAMINATED SOIL AT THE SITE ARE PROVIDED IN TABLES 33 THROUGH 35 AND ARE DISCUSSED BELOW. SPECIFICALLY, THE SELECTED REMEDY USES A TREATABILITY VARIANCE TO COMPLY WITH RCRA LAND DISPOSAL RESTRICTION STANDARDS.

#### 11.2.1 ACTION-SPECIFIC ARARS

ACTION-SPECIFIC ARARS ARE THOSE ARARS THAT PLACE ACTIVITY-BASED REQUIREMENTS ON A PARTICULAR TECHNOLOGY OR PLACES CONDITIONS ON DEALING WITH SPECIFIC SUBSTANCES. TABLE 33 IDENTIFIES THE POTENTIAL ACTION-SPECIFIC ARARS FOR THE ABERDEEN PESTICIDE DUMPS SITE.

#### 11.2.2 CHEMICAL-SPECIFIC ARARS

CHEMICAL-SPECIFIC ARARS INCLUDE THOSE LAWS AND REGULATIONS GOVERNING THE RELEASE OF MATERIALS POSSESSING CERTAIN CHEMICAL OR PHYSICAL CHARACTERISTICS, OR CONTAINING SPECIFIED CHEMICAL COMPOUNDS. THESE REQUIREMENTS GENERALLY SET HEALTH OR RISK-BASED CONCENTRATIONS LIMITS OR DISCHARGE LIMITATIONS IN VARIOUS ENVIRONMENTAL MEDIA FOR SPECIFIC HAZARDOUS SUBSTANCES, CONTAMINANTS AND POLLUTANTS. THERE ARE NO CHEMICAL-SPECIFIC ARARS WHICH SET THE CONCENTRATION LIMITS FOR THE EXCAVATION CRITERIA OF CONTAMINATED SOIL AT THIS SITE. HEALTH-BASED RISK LEVELS WERE ESTABLISHED ACCORDING TO EPA PROTOCOL SO THAT THE SITE WOULD POSE A TOTAL LIFETIME EXCESS CARCINOGENIC RISK OF LESS THAN  $(10^{-6})$ . TABLE 34 OUTLINES POTENTIAL CHEMICAL-SPECIFIC ARARS FOR THE SITE.

#### 11.2.3 LOCATION-SPECIFIC ARARS

LOCATION-SPECIFIC ARARS ARE DESIGN REQUIREMENTS OR ACTIVITY AND/OR CONTAMINANT CONCENTRATION RESTRICTIONS BASED ON THE GEOGRAPHICAL OR PHYSICAL POSITION OF THE SITE AND ITS SURROUNDING AREA. TABLE 35 IDENTIFIES POTENTIAL LOCATION-SPECIFIC ARARS FOR THE SITE.

#### 11.3 COST-EFFECTIVENESS

ALTERNATIVE 7 AFFORDS A HIGH DEGREE OF EFFECTIVENESS BY PROVIDING PROTECTION FROM DIRECT CONTACT WITH PESTICIDE CONTAMINATED SOILS. THERMAL TREATMENT OF CONTAMINATED SOILS WILL ALSO PROVIDE ADEQUATE PROTECTION TO THE UNDERLYING AQUIFER BY PERMANENTLY REMOVING THE SOURCE OF CONTAMINATION. ALTERNATIVE 7, THE LEAST COSTLY ALTERNATIVE, IS THE MOST COST-EFFECTIVE ALTERNATIVE WHICH PROVIDES THE GREATEST PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT. IF THE INCINERATION TECHNOLOGY IS INVOKED, IT ALSO IS A COST-EFFECTIVE ALTERNATIVE PROVIDING THE GREATEST PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT.

#### 11.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

USEPA AND THE STATE OF NORTH CAROLINA BELIEVE THE SELECTED REMEDY, THERMAL DESORPTION REPRESENTS THE MAXIMUM EXTENT TO WHICH PERMANENT SOLUTIONS AND TREATMENT TECHNOLOGIES CAN BE UTILIZED IN A COST-EFFECTIVE MANNER FOR A SOURCE CONTROL REMEDY OF CONTAMINATED SOILS AT THE ABERDEEN PESTICIDE DUMPS SITE. OF THOSE ALTERNATIVES THAT ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT AND COMPLY WITH ARARS, THE STATE OF NORTH CAROLINA AND EPA HAVE DETERMINED THAT THIS SELECTED REMEDY PROVIDES THE BEST BALANCE OF TRADE-OFFS IN TERMS OF LONG-TERM EFFECTIVENESS AND PERMANENCE, REDUCTION IN TOXICITY, MOBILITY, OR VOLUME ACHIEVED THROUGH TREATMENT, SHORT-TERM EFFECTIVENESS, IMPLEMENTABILITY, AND COST.

THE SELECTION OF TREATMENT OF THE CONTAMINATED SOIL IS CONSISTENT WITH PROGRAM EXPECTATIONS THAT INDICATE THAT HIGHLY TOXIC AND MOBILE WASTE ARE A PRIORITY FOR TREATMENT AND OFTEN NECESSARY TO ENSURE THE LONG-TERM EFFECTIVENESS OF A REMEDY. OPTIONS EVALUATED IN DETAIL WHICH DO NOT REQUIRE TREATMENT, SUCH AS ENVIRONMENTAL MONITORING AND CAPPING, OBVIOUSLY DO NOT MEET THE STATUTORY REQUIREMENT FOR THE UTILIZATION OF PERMANENT SOLUTIONS. ALTERNATIVE 7 MEETS THIS STATUTORY REQUIREMENT BY PROVIDING A PERMANENT SOLUTION WHILE UTILIZING AN ALTERNATIVE TREATMENT TECHNOLOGY.

IN THE EVENT THE CONTINGENCY REMEDY (ON-SITE INCINERATION) WILL BE EMPLOYED, IT WILL ALSO MEET THE STATUTORY REQUIREMENT BY PROVIDING A PERMANENT SOLUTION TO SITE CONTAMINATION WHICH UTILIZES A TREATMENT TECHNOLOGY TO THE MAXIMUM EXTENT PRACTICABLE.

#### 11.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

BY TREATING THE PESTICIDE CONTAMINATED SOILS IN A THERMAL DESORPTION UNIT, AND STABILIZATION/SOLIDIFICATION OF ANY RESIDUALS WITH METAL CONTAMINATION, WHICH MAY REMAIN HAZARDOUS FOLLOWING TREATMENT, THE SELECTED REMEDY ADDRESSES ONE OF THE PRINCIPAL THREATS POSED BY THE SITE THROUGH USE OF TREATMENT TECHNOLOGIES. THEREFORE, THE STATUTORY PREFERENCE FOR REMEDIES THAT EMPLOY TREATMENT AS A PRINCIPAL ELEMENT IS SATISFIED.

THIS STATUTORY REQUIREMENT WOULD ALSO BE SATISFIED BY THE USE OF THE CONTINGENCY REMEDY, ON-SITE INCINERATION.